ELECTRICAL WORLD

A Consolidation of Electrical World, Electrical Engineer and American Electrician

L. W. W. MORROW, *Editor*

ALLEN M. PERRY
Managing Editor

A. E. KNOWLTON
Associate Editor

E. R. SEARLES
News Editor

G. F. WITTIG
Statistical Editor

EARL WHITEHORNE
Contributing Editor

JAMES H. RUDD
Publishing Director

FRANK R. INNES
Western Editor
520 N. Michigan Ave.
Chicago

C. W. LEIHY
Pacific Coast Editor
883 Mission St.
San Francisco

H. S. KNOWLTON
Contributing Editor
1427 Statler Bldg.
Boston

PAUL WOOTON
Washington
Correspondent
National Press Building
Washington

What in the World!

Going off the gold standard has resulted in a rise in the price of commodities and stocks. No one knows how far these trends will go, but it is the part of wisdom to buy engineering equipment needed now. It seems certain that present prices are at the bottom.

●

The unit power station has been one of our hobbies for many years. In this issue Mr. Goodale shows a contemplated station design that uses the unit idea and, in addition, the outdoor station idea. This design represents a peak development of the large-unit, large-station practice. But the economics indicate that these ideas apply equally well to the present conception of the use of multiple small stations. The great savings to be made in future steam plants lie in reducing first costs and fixed charges.

●

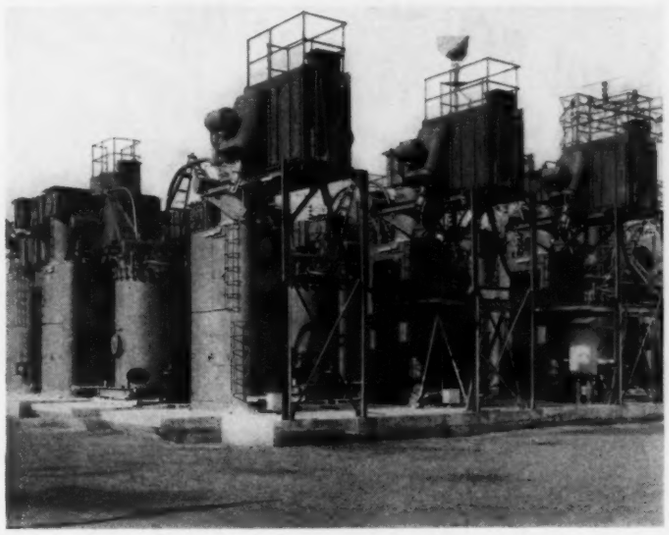
We don't know where Mr. Morrow found all those contractor-dealer cases, but we do know that he develops some interesting and constructive ideas. We hope to have articles on wholesaling and single and multiple product manufacturing to follow in this series. It is interesting to note that Washington is busy also discussing ways and means to control prices, production and wage rates. We believe industry can do these things best for itself under governmental regulation.

●

Congress is still jockeying with the Tennessee, St. Lawrence and utility taxation. This is having a serious effect upon electrical industry developments because of the uncertainties of the situation. It is high time the administration took action to let the industry know its utility legislation program, if it has one.

●

We are glad inflation is here. It was the only answer to our domestic business situation, but even so, inflation must be controlled or this answer will bring worse instead of better conditions.



Outdoor switchgear, Waukegan station

APRIL 29, 1933

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ELECTRICAL WORLD

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for the Week Ending

April 29, 1933

Muscle Shoals—Tennessee Valley Bills Lack Congressional Accord

STARTING with two not-wholly-dissimilar measures for the development of the Tennessee Valley, in accordance with the supposed wishes of President Roosevelt, Congress appears torn between conflicting impulses which may well delay action for a long, long time.

Senator Norris, warmly espousing his now-venerable Muscle Shoals measure with a Tennessee Valley afterthought, still hopes for a development which would involve cheap fertilizer and power with the government in business on a cosmic scale, a weapon consisting of a power project and far-reaching transmission lines to show the electric utilities what is what, direction through three men who would be subject only to congressional discipline, and the old, familiar "profession of faith" demand for those commissioners appointed who would hold office just so long as they swore by the "feasibility and wisdom of the act."

House revises measure

In the House of Representatives the three-sponsor bill originally introduced underwent radical revision this week, finally being approved by a vote of 306 to 91. Significant changes were: Congressional removal of commissioners no longer provided for, "profession of faith" clause eliminated, dams and power plants must be self-liquidating projects, nitrate plants may be leased for the production of fertilizer and altered transmission line proposals. The latter now call for the building of competing energy distributing facilities by the government only if satisfactory terms cannot be made with private companies for the use or purchase of existing lines, and then only if the proposed construction be established as "economically justified." A 400-mile limit was set.

Early agreement unlikely

The House bill was sent to the Senate, where major changes appear certain, after the former group of legislators rejected a proposal to adopt the Senate bill by a vote of 326 to 68. The measure sponsored by Senator Norris went no further in the deliberations of that body than to emerge from the agriculture committee with its approval. No pushing of the measure is likely before the farm relief bill is accorded action.

Major points of disagreement between House and Senate will probably continue to center around transmission line provisions. Norris wants government operation of plants and construction and operation of power lines. The House would, preferably, leave this to private industry.

I should like to make it clear that the immediate future holds more of valuable novelty in it than ever. It is evident that study and research, broadly speaking, slow down but little, if any, from year to year. My brief experience of three decades in industry has convinced me that orderly research work in industrial science is really the basis of our civilization.

WILLIS R. WHITNEY
formerly, Director of Research,
General Electric Company

[Dr. Whitney, addressing the Harvard Business School during its 25th anniversary celebration last week, with the topic of "The Relation of Science to Industry" confined himself to the record of what has been accomplished, saying, "I cannot see ahead, but anyone may see behind and look ahead."]

▼

Westinghouse Shows Loss; Sales Increased in March

Though the quarterly statement of the Westinghouse Electric & Manufacturing Company, just issued, shows a substantial loss the company reports bookings for March to have been the largest for any month since July 1932. The net loss for the quarter was $3,491,572.

Comparative figures for the first quarter of 1933 with the first and the last quarters of 1932 are as follows:

	Quarter Ended		
	March 31, 1933	March 31, 1932	Dec. 31, 1932
Orders received	$12,847,801	$20,388,658	$14,224,530
Sales billed	13,161,721	20,377,948	16,615,730
Net loss	3,491,572	1,320,148	2,986,289

As of March 31 cash and marketable securities amounted to $31,597,253, compared with $32,851,763 at December 31, 1932. Westinghouse had a relatively small amount of its cash on deposit in banks that have not reopened.

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Chats Falls Damages Awarded

Though the Kingdon Mining, Smelting & Manufacturing Company, Ltd., alleged damages of $2,222,422 and sued the Hydro-Electric Power Commission of Ontario for that amount, the judgment of the Ontario Municipal Board, acting as arbitrator, is that the company

was entitled to compensation of but $88,368. The suit arose over alleged damage to riparian rights, etc., in the Chats Falls power development area.

▼

Cities Service Trading Sifted at Federal Hearing

Testimony that during the stock market crash of October, 1929, the Cities Service Securities Company spent more than $128,000,000 purchasing common stock of its parent, the Cities Service Company, was presented to the Federal Trade Commission this week by Thomas W. Mitchell, the commission's economist-examiner. The testimony was given as hearings opened on the securities company, marketing and trading agency set up in 1927 by Henry L. Doherty & Company. The securities company was owned wholly by the Cities Service Company.

For the sum of $128,000,000 2,372,-101 shares of Cities Service were bought, he said, "but, as these amounted only to about two-fifths of the total quantity of that stock thrown into the market, they were not sufficient to uphold the market price, which broke to a low of $20 on October 29." Maintaining that the securities company's principal function was to provide a ready resale market for Cities Service securities, facilitate marketing and supervise the market for these stocks, Mr. Mitchell said that its market activities constituted "an outstanding example of what is believed to be a general practice in modern finance and stock market control."

"Buying for orders," says company

"Inasmuch as the securities company is wholly owned by Cities Service Company, its performance of this function with reference to the parent company's stock virtually amounts to Cities Service Company's trading in its own stock," Mr. Mitchell said. "Such activity is regarded with disfavor by the governing body of the New York Stock Exchange." He pointed out that Cities Service issues are listed on the New York Curb. Such market activities, Mr. Mitchell added, might be carried on in such volume "as to induce a general orgy of speculation in which stock prices go to absurd heights, from which they must inevitably crash, to the great injury not only of the speculators but of the entire nation."

In connection with the report, counsel for the securities company issued a statement saying: "All the buying the Cities Service Securities Company did on the Curb Exchange was solely for the filling of orders. It was the public that was buying. The reason the securities company bought on the curb was because it had to buy on the market in which stockholders chose to sell their shares."

▼

Unit Air Conditioner Here at Last

De La Vergne-Baldwin Southwark Corporation

No piping, whether for refrigerant or water, is needed for the latest type of portable air-conditioning equipment. Working on the reversed cycle principle, it blows hot or cold, moist or dry as inside atmospheres may require to produce the greatest comfort. Fresh air is constantly supplied from outdoors, complete filtration is afforded and circulation at the rate of 600 cu.ft. a minute maintained. The electrical rating is 2 kw., with a refrigerating capacity of 1½ tons of melting ice equivalent every 24 hours. At his desk is Samuel Vauclain, chairman of the board, Baldwin Locomotive Works.

McClure Bill Fought; Senator Attacks Pinchot

Opposition to Senator McClure's utilities regulation bill developed during the past week at a Democratic caucus in the Pennsylvania House, with Representative C. H. Rhodes leading the attack. The McClure bill, designed to broaden the power of the Public Service Commission, is opposed by Governor Pinchot, whose own bill was introduced in the Senate recently (ELECTRICAL WORLD, April 22, page 502). Mr. Rhodes, who has supported the Pinchot program in the House, characterized the McClure measure as a "milk and water proposition as it comes from the Senate." "It doesn't amount to anything except a lot of words," Mr. Rhodes commented.

Shortly after the House caucus a vehement defence of his bill and a spirited attack on Mr. Pinchot was made by Senator McClure on the floor of the Senate. In a lengthy statement he charged the Governor with playing politics in his attack and praised the measure as one designed "to remedy the ills which have appeared in utility operation in Pennsylvania and elsewhere. "I believe my bill is a step in the right direction," he stated.

In assailing Mr. Pinchot, the Senator said: "Now the Governor, at the last moment and when the Legislature is almost ready to adjourn, unfairly and by inaccurate statements and innuendoes attacks my bill and proposes other legislation on this subject. If Governor Pinchot has read my bill, his remarks concerning it are not as frank and accurate as one would expect from a Governor, and particularly from one who poses as the guardian of the people." He declared that the Governor killed the 1931 utility control bill for political reasons.

▼

Groesbeck Heads Foreign Power

As a further step in the readjustments following the withdrawal of Sidney Z. Mitchell from activity in the utility industry (ELECTRICAL WORLD, April 1, page 402), C. E. Groesbeck has been elected chairman of the American & Foreign Power Company. S. R. Inch becomes vice-chairman, while C. E. Calder remains as president. Other changes of note in the affairs of the company are the withdrawals from the directorate of Sidney Z. Mitchell, George H. Howard, Clarence Dillon and Charles E. Mitchell.

▼

Federal Board Appropriations

In submitting to the House of Representatives his revised estimate for the 1934 independent offices supply bill carrying

a reduction of $468,407,000 from the similar measure vetoed by former President Hoover, President Roosevelt recommended that slashes be made in the appropriations for both the Federal Trade and Federal Power commissions. The respective recommendations were from $1,101,500 to $920,000 and from $235,373 to $210,000.

▼

Detroit Edison Finds Press an Agency for Defense

In an interest-compelling series of typewritten letters reproduced on the Detroit Edison Company' stationery, considerably enlarged and signed by Alex Dow, president, that company is bringing to the attention of its customers through the Detroit newspapers certain facts about the company's business. The letters appear five days a week.

One letter appearing at the end of the third week stated that the company in 1932 paid 4 per cent of the total taxes assessed by the city of Detroit and 7 per cent of the money actually collected. Tax money out of the company's earned dollar rose from 5 cents in 1920 to almost 13 cents last year. For every $2 paid out in wages $1 was paid in taxes. The total tax bill in 1932 amounted to $5,699,000, a fifty-fold jump in 25 years. That the customers pay the taxes, the company states frankly and repeatedly. "We're all in the same boat," says Mr. Dow, "the taxes are more than in 1929, when we were selling much more electricity."

Some facts developed

Among other facts, the letters have discussed labor, deposits, bad debts, etc. Never, states the series, has the company had a strike, either with union or non-union men. It had to go on a five-day week in 1932 and some men now work only three or four days, but no men who began with the company as late as 1930 are permitted to go on the city welfare in Detroit or any other community, even though they are unemployed at the present time. "Nowadays it is costing us too much to do business in the big city," one letter said in part. "We found it cost us less to do business in the smaller places and we made all rates the same . . . You might notice that two of our best power plants, including our largest plant, are out in Trenton and Marysville."

"Our business is done on credit . . . We seldom ask for guarantees or deposits when the customer is well spoken of, and in eighteen months we give back the deposit. Just now we have 28,200 deposits and very few guarantees . . . These days too many people are out of luck, and we have 106,600 customers for whose payments we are waiting . . ." The letters are to be continued in an indefinite series.

Are Solemn Covenants Too Old Fashioned?

It is difficult, if not impossible, for anyone with a sense of personal or national integrity to understand how the United States government can fail to meet the solemn and specific terms of contract in its bond issues which call for payment in gold of the standard of weight and fineness effective at the time that the promise to pay was made. Abrogation of such promises is indefensible in any terms of apology or necessity that may be phrased, especially when this nation holds more gold than at any time in its history. If inflation is necessary it can be secured effectively without juggling the currency and without renouncing everything that is involved in the ordinary standards of honesty of man to man.

Just how far business or individuals will go in borrowing or loaning funds in the future without the least assurance that, at the maturity of the loan, dollar-for-dollar return will be made is highly uncertain. One hears that the dollar is to be revalued with between 25 and 50 per cent less gold content than it had. That this will be done when the international conference meets.

As if to give the lie to the currency inflationists' theme song, the outstanding currency as of the week ended April 19 showed $79,000,000 returned. Energy production continues its rise. Carloadings fall slightly. Bituminous coal production resumes its standing at approximately the levels of last year. Commodity prices have risen to the levels of a year ago. Steel output is at 27 per cent. General indexes show strength.

It is interesting that Washington telltales would have it that neither President Roosevelt's Cabinet nor the Federal Reserve Board had a hand in the production of the infamous inflation bill. It is reputedly the work of a Council of Ten, who, quite incidentally, are not now in agreement about its desirability nor in sympathy, if two notable exceptions count, with its methods.

Federal Control of New River Protested by Virginia

That the state of Virginia intends to continue the energetic battle which has been raging for some time for the right of the state to control its water power became manifest last week when the Corporation Commission, upon hearing that the city of Radford had applied for a major license under the federal act rather than for a state license under the state water-power act, wired the Federal Power Commission protesting the assumption by the federal tribunal of jurisdiction over Little River, the stream on which the city of Radford proposes to erect a power dam. At the same time, arrangements were made to have R. Gray Williams of Winchester, special attorney for the state in the New River case, prepare formal protest in behalf of the state Corporation Commission and the state Commission on Conservation and Development.

"The state Corporation Commission and the state Conservation and Development Commission," the wire stated, "desire to protest most earnestly against the Federal Power Commission assuming jurisdiction over the hydro-electric project on Little River mentioned in the city of Radford application to you dated March 1, 1933, and respectfully request that you give five days to submit formal protest in the protection of the rights and dignity of the commonwealth of Virginia." In reply the Federal Power Commission said that it would gladly receive and consider any protest from the commissions submitted prior to May 15.

Meanwhile, the New River case, decided against the state's interest in the United States District Court (ELECTRICAL WORLD, April 8, page 436), is being carried to the United States Circuit Court of Appeals, with the state fighting stubbornly for jurisdiction over New River in the case of the Appalachian Electric Power Company project not far from the site of the proposed Little River dam of the city of Radford.

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Interstate Tax Commission Favors State Levy on Energy

After conferences between federal and state official representatives the Interstate Commission on Conflicting Taxation has recommended that some taxes be left to the federal government, as in the case of the tobacco excise, while others, as in the case of the gasoline and electrical energy taxes, be permitted to constitute the unduplicated province of the states. The principal reason for the latter recommendation is said to be wide variation in conditions of electrical energy production and distribution throughout the country.

An analysis of the duplications in the taxation of electrical energy production, as prepared by the commission, appeared on page 466 of the April 15 issue of ELECTRICAL WORLD.

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Electrical Exposition Planned

Under the sponsorship of the Electrical Association of New York, Inc., a national electrical exposition, including radio, refrigeration, air conditioning and home and industrial appliances, will be held from September 20 to 30 at Madison Square Garden, New York. The Madison Square Garden Corporation has agreed to furnish the space, management, promotion and financial security of this exposition, which will provide an opportunity for manufacturers to exhibit new devices and equipment developed in recent years.

Coming Meetings

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. Summer convention, Chicago, Ill., June 26-30. H. H. Henline, 33 West 39th St., New York.

Electrochemical Society—Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Electrical Manufacturers Association—Hot Springs, Va., May 22-26. A. W. Berresford, 570 Lexington Ave., New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexinton Ave., New York.

Canadian Electrical Association—Lucerne-in-Quebec, June 14-16. B. C. Fairchild, Power Building, Montreal, Que.

American Society of Mechanical Engineers—Chicago, Ill., June 26-30. C. W. Rice, 29 West 39th St., New York.

American Society for Testing Materials—Chicago, Ill., June 26-30. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Engineers' Day. Century of Progress Exposition—Chicago, Ill., June 28. G. E. Pfisterer, 308 West Washington St., Chicago.

Illuminating Engineering Society—Delavan, Wis., August 28-31. D. W. Atwater, 29 West 39th St., New York.

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Lamp Quotas Discussed at Massachusetts Hearings

Pressed by petitioners seeking reduced rates on the part of the Edison Electric Illuminating Company of Boston, representatives of the Hygrade-Sylvania Corporation this week revealed before the Massachusetts Department of Public Utilities that licensee agreements prevent a lamp manufacturer from accepting more than a limited amount of business from individual customers. According to R. S. Bradner, Boston sales representative of the corporation, he is limited under penalty clauses from doing a maximum business of more than $100,000 a year from any one customer in his district.

Commenting upon the same situation, B. L. Young, legal adviser of the Hygrade company, said it, like all other independent licensed makers operating under agreement with the General Electric Company, observes output limitations to avoid the penalty which must be paid if the quota, based upon monthly reports from the General Electric lamp division, is exceeded. Such limitations of sales were pointed out by Mr. Young to have been held by the Supreme Court not to be a violation of the anti-trust laws because of the fundamental patent control involved.

"When we purchased the Triumph company's plant and business in Indianapolis," testified Mr. Young, "we cared most for the quota, and had to obtain the consent of the licensing manufacturer to acquire this."

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Northwest Engineers Discuss Economies

ECONOMY measures in construction and operation dominated the discussions of the engineering section of the Northwest Electric Light and Power Association gathered at the tenth annual general meeting in Portland last week. Between the conference sessions the executive committee met to discuss ways in which the engineering section could be of increasing value to member companies in the territory during the future activity of the Northwest Association, which is now operating as an independent territorial association. The section has decided to group its activities under four major headings: (1) generation, (2) transmission and distribution, (3) utilization and (4) general, thus simplifying to some extent its committee organization as against that obtaining during the régime of the National Electric Light Association.

Improved load analysis

An original idea was presented by George E. Quinan, Puget Sound Power & Light Company, chairman of the power systems engineering committee, who expounded a method of determining seasonal variations of system energy output which would permit of an exact determination of whether the output of any one week or other period of time was in fact an increase or a decrease from normal. The method involves, first, the calculation of a no-growth output curve for a year, from which are eliminated all variations due to business lost or gained; the relation of the actual output curve to the no-growth curve at any time indicates the exact status of the company's business and the trend of this business not obtainable accurately by comparison of the actual output of a week or month this year against the same week or month last year. Further, any change in shape or general characteristic of no-growth curves for consecutive years indicates the precise results of load-building activities.

Five economy suggestions

Five ways of economizing in ordinary maintenance and operation were disclosed in a study by M. T. Crawford, Puget Sound Power & Light Company, in the program of the overhead systems committee. Among other suggestions, the author pointed out that a simplification in organization of personnel, records and reports would cut expenses; that closer inspection of property made possible a more exact determination of necessary replacement, thus avoiding the deferring of needed maintenance, and that a fertile field for economy was found in avoiding accidents and property damage by an improved safety program.

In the electrical apparatus and meter committee R. F. Davis, Grays Harbor Railway & Light Company, summarized the operating experience of nine com-

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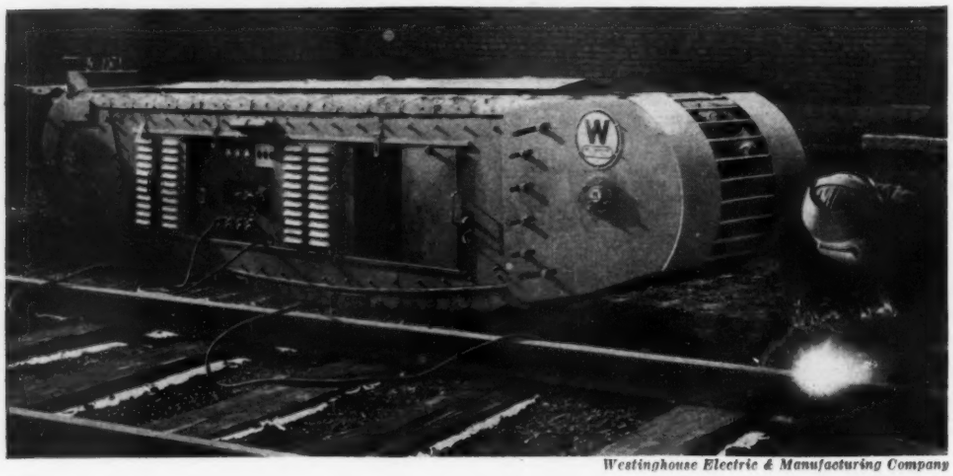
Ready to Weld Anywhere



Westinghouse Electric & Manufacturing Company

Developed to fill the need for a mobile power supply unit which does not require frequent transferring to and from the track for movement from one point to another, six tractor welders will eliminate the use of long and expensive cable leads and not interfere with traffic or signal operations, when they go in service to reclaim battered rail ends, crossovers, switches, frogs, repair bridge structures and to furnish auxiliary power for maintenance-of-way tools such as rail grinders, drills, slotters, etc., on the Lehigh Valley Railroad, shortly. The unit is entirely self-contained.

panies in the territory relative to the diversion of current from the meter, which indicated a considerable increase in energy lost through this channel. The report covered methods of detection and analyzed the adaptation of the new meter sequence as a corrective measure. No conclusion was reached as to the economic point at which substantial expenditures should be undertaken to make theft practices more difficult.

Fuse recommendation

In a discussion of the use of high-voltage fuses instead of circuit breakers in a paper by E. F. Anderson and Ferd Henkle, Portland General Electric Company, the conclusion was reached that the present necessity for economies in construction and operation dictate the use of fuses on lines where differential protection and the simultaneous opening of three phases is not absolutely necessary.

Dredging operations in the Columbia River adjacent to the high-voltage submarine cable of the Northwestern Electric Company made necessary the exact location of this cable after it had been laid for one year. George A. Drewett of that company described a method of cable location involving the use of an exploring coil with audio-amplification.

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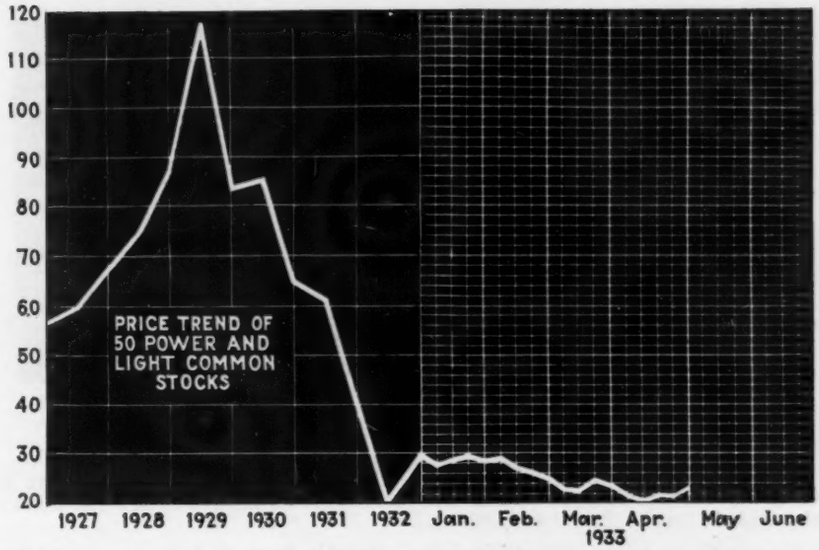
Laclede Stock Sale Banned by Missouri Supreme Court

Reversing the judgment of the Cole County Circuit Court which sustained the ruling of the State Public Service Commission granting authority to the Utilities Power & Light Corporation of Chicago to acquire and hold more than 10 per cent of the stock of the Laclede Gas Light Company and the Laclede Power & Light Company, the Supreme Court of Missouri has directed the Circuit Court to reverse its decision and to set aside the orders of the commission. Appeal from the ruling of the commission was taken by the city of St. Louis, which intervened as an interested party objecting to the granting of the applications. The Utilities Power & Light Corporation, a Virginia corporation, owns all the capital stock of Laclede Gas & Electric Company, which in turn owns the controlling interest in the two St. Louis utility corporations.

In ruling against the Chicago company the Missouri Supreme Court again laid down the principle that benefit to the general public must be shown before a holding company shall be permitted to acquire control of the public utility company in the state. The decision, written by Commissioner James A. Cooley, reaffirms the ruling of the court in reversing an order of the commission in permitting the transfer of practical stock control of the St. Louis Public Service Company to the City Utilities Company (ELECTRICAL WORLD, October 8, 1932, page 484). That opinion held that public policy of Missouri was opposed to the acquisition of more than 10 per cent of the outstanding stock of a public utility by another corporation and that the Public Service Commission should only sanction such a purchase after a definite showing had been made that the public would benefit.

"That decision," Judge Cooley said, "is in point and controlling on this issue in the instant case. In this case it was not and under the evidence could not be found by the commission that any benefit could be expected to result to the domestic utility companies or to the public if the applications were granted. The only benefit suggested by the evidence was to the applicant in the saving of some taxes it now has to pay."

Light and Power Stocks Rise



Following the pace set by other stocks, utility issues climbed upward in the inflation rally. Prices later receded, but gains brought the "Electrical World" index up from 21.3 to 22.6.

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House Shifts Energy Tax from Consumer to Utility

In a proposal added to the special revenue-postage bill the House of Representatives last week voted to transfer the federal tax on electricity, amounting to 3 per cent, from the consumer to the producing utility. The bill to give the President authority to modify postal rates was under consideration when Representative Whittington of Mississippi offered an amendment to transfer the tax. The Chair over-ruled a point of order that the amendment was not germane to the pending measure and Mr. Whittington's proposal was adopted by a teller vote of 153 to 73.

The tax on electrical current was provided in the revenue act of 1932 and the original House measure placed it on the producer. The change was made while the bill was in conference between the two houses. Mr. Whittington reminded the House of these circumstances and said the House had voted for the conference report that the revenue bill might not be delayed. "We did so," he said, "on the promise of the leaders that the House position in favor of relieving the consumer of this tax would be asserted at the first opportunity. This is the first opportunity." The bill now goes to the Senate.

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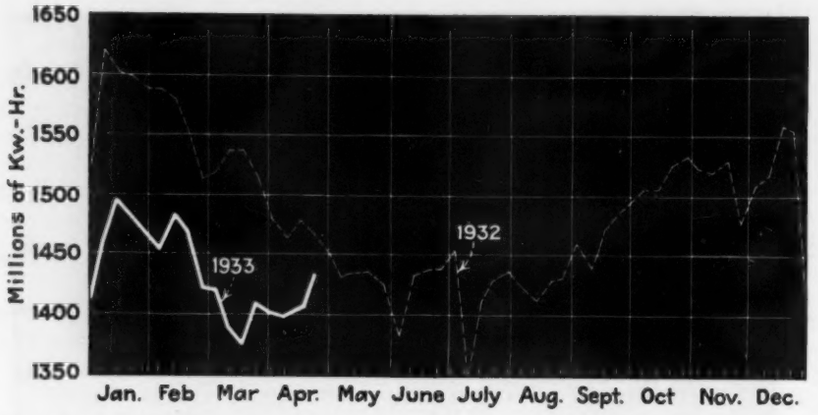
Duquesne Light Issues 1932 Report

(Year ended December 31)

Earnings		
Gross earnings	$25,223,690	9.3% below 1931
Net earnings	$14,262,919	12.8% below 1931
Operating ratio	.43	in 1931, 41
Depreciation allowance	$2,017,895	8.0% of gross earnings 0.1% of plant investment
Times prior charges earned	3.2	in 1931, 3.6
Net balance per share of common	$4.83	in 1931, $6.00
Dividends declared on common	$4.50	in 1931, $4.49
Output		Compared with 1931, per cent
Energy sales, kw.-hr.	1,057,998,897	—13.5
Maximum load, kw.	245,000	—15.2
Average use per customer, kw.-hr.	3,545	in 1931, 3,950
Balance Sheet		Compared with 1931, per cent
Total assets	$200,539,353	+2.2
Funded debt	$ 70,000,000	+7.6
Capitalization	$154,313,120	+4.1
Total surpluses plus reserves	$ 41,812,854	+4.1
Ratio current assets to current liabilities	16.9	in 1931, 2.7

Output Highest Since February



Further rise in factory operations is indicated in the reported output of electric light and power plants during the week ended April 22, 1,431,095,000 kw.-hr. This is the highest since the week of February 18. It wipes out the usual spring decline due to the decreasing lighting load. It signifies a gain of 1.5 per cent over the preceding week, 2.3 per cent in two weeks and 4 per cent over the low point of March 18. The loss compared with the preceding year is cut to 2.6 per cent, smallest since the summer of 1931.

The Atlantic Seaboard climbed to parity with 1932; New England is 1.1 per cent above; the Central area is down only 3.6 per cent. These are the best regional figures in several years.

Weekly Output, Millions of Kw.-Hr.

Week ended	1933	1932	1931	1930
April 22	1,431	1,470	1,676	1,725
April 15	1,410	1,481	1,641	1,733
April 8	1,399	1,465	1,647	1,715
April 1	1,402	1,480	1,680	1,708
March 25	1,410	1,515	1,689	1,723

Per Cent Change from Previous Year

Region	Week Ended Apr. 22	Apr. 15	Apr. 8
Atlantic Seaboard	+0.1	— 4.9	— 2.7
New England alone	+1.1	— 6.0	— 3.8
Central industrial	—3.6	— 6.3	— 5.7
Pacific Coast	—6.4	— 6.6	— 6.8
United States	—2.6	— 4.8	— 4.5

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Protective Committees Act to Guard Insull Investors

Depositing and non-depositing bondholders have been advised by the protective committee representing holders of Northeastern Public Service Company general lien and collateral trust 5½ per cent gold bonds that more than 27 per cent of the total issue has been placed with the depositories, and that the committee has pledged itself to a program that will involve foreclosure proceedings under the general lien indenture, assuming the co-operation of the bondholders through deposit of their bonds.

While several reorganization plans involving capital readjustment of the company and subsidiaries have been considered by the committee, of which James T. Woodward is chairman, it has decided that the present is not an opportune time to attempt such capital change. Under the program it has proposed the committee would, through the foreclosure proceedings, bid in on behalf of the bondholders the pledged securities of subsidiary companies subject to the lien of the subsidiary bonds in the hands of the public and the prior-lien 5½ per cent bonds now outstanding in the amount of $4,670,500. The company was a unit in the former Insull system and owns 56 operating subsidiary companies in twelve states.

Suits filed by the Insull Utility Investments, Inc., protective committee of 1,000 against ten Chicago and New York banks and the General Electric Company to require the return of deposited collateral have been amended to make the trustee in bankruptcy, Dean Harry A. Bigelow, a party defendant. Only one answer has been filed to the suits instituted by the committee and this was by the General Electric Company, which alleged lack of jurisdiction. Answers by the banks are required to be filed by May 1.

Middle West extension

An order has been entered in federal court in Chicago continuing until May 1, 1933, the time within which petitioning creditors may file their bill of particulars in the Middle West Utilities bankruptcy case. The continuance was for the purpose of allowing more time for completing the draft of the recently announced agreement among interested groups to be presented to the court for approval.

Among the new appointees to positions in the reorganizing Insull subsidiaries are John N. Shannahan, formerly president of the Indiana Service Corporation, selected for the chairmanship of that company, and Morse DellPlain, selected for the presidency. Directors of another Indiana company in the Insull system, the Public Service Company of Indiana, have voted to suspend payment of a dividend on the $6 cumulative preferred stock, which would have been payable May 15 to stockholders of record of April 29.

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Electrolytic Hydrogen Linked to Transmission Plan

Combining, allegedly, the desiderata of high conversion efficiency, good energy transmission characteristics and use of off-peak generation, it is proposed (*Engineering*, [England] April 14, page 399), that hydrogen engines operating with gas produced in high-pressure electrolyzers be adopted for the local generation of electricity.

High-pressure electrolyzers are said to be the most efficient producers of hydrogen gas known, yielding about 1 cu.ft. of hydrogen and ½ cu.ft. of oxygen, compressed to 2,150 lb. per square inch, for every 0.12 kw.-hr. fed in. At pressures of 4,000 lb. per square inch, obtainable at the electrolyzer, small diameter pipe lines could be used for transmission, it is stated, more cheaply than can high-tension overhead power lines.

Efficient hydrogen engines of the Erren type are said to be guaranteed to consume not more than 17.6 to 21.2 cu.ft. of hydrogen per horsepower-hour. Distilled water is required for the electrolyzers. One kw.-hr. is equivalent to 3,414 B.t.u. and produces 7 cu.ft. of hydrogen having a calorific value of 2,450 B.t.u. The electrolyzer efficiency is, therefore, some 71 per cent. Hydrogen engines of 40 per cent thermal efficiency would transform 980 B.t.u. out of these 2,450 B.t.u. into useful work. So, of the original 3,414 B.t.u., some 980 B.t.u. are recovered as useful work corresponding to an over-all efficiency of 29 per cent.

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British Energy Output Continues to Show Gains

Official returns to the British Electricity Commission show 1,160,000,000 kw.-hr. of electricity to have been generated by authorized undertakers in the United Kingdom during March, 1933, as compared with the revised figure of 1,091,000,000 kw.-hr. in the corresponding month of 1932. This is an increase of 69,000,000 kw.-hr., or 6.3 per cent.

During the first three months of 1933 the total amount of energy generated by authorized undertakers was 3,647,000,-

000 kw.-hr., as compared with the revised figure of 3,386,000,000 kw.-hr. for the corresponding period of 1932. This represents an increase of 261,000,000 kw.-hr., or 7.7 per cent.

Oregon Commission Order Hits Utility Merchandising

Complete separation of the merchandising and jobbing activities of utility companies in the state of Oregon from the operating end of the business appears to have been aimed at in the supplemental order issued recently by Charles M. Thomas, public utilities commisisoner, pertaining to the case heard a year ago in the matter of accounting practices of public utility companies with reference to the merchandising business of those companies. The recent order is issued "to make effective a segregation of the accounting of their merchandising departments from their respective public utility functions and to charge to their merchandising activities all items of expense incurred in the merchandising of appliances."

The order is quite brief and after ordering a complete separation of the department it states: "No employee engaged in the regulated utility business shall perform any duties for the merchandising and jobbing department, solicit or sell merchandise, or otherwise engage in jobbing activities, except the principal executive officers of the company."

Previous orders in this case (issued in March and July, 1932) prescribed accounting practices and set up a special classification of accounts for merchandising departments and declared merchandising activities to be non-operating activities. The precise effect of the recent order on the load-building activities of utility companies—that is, the extent to which such activities may be restricted by this order—has not been definitely determined.

Westinghouse Speeds Up

Refrigeration production continues its activity (ELECTRICAL WORLD, April 22, page 503). Westinghouse Electric & Manufacturing Company was scheduled to produce 4,500 electric refrigerators during April. Its plant at Springfield, Mass., is employing 2,000 hands and is increasing operations. Orders on hand for refrigerators are said to total in excess of 10,000 units.

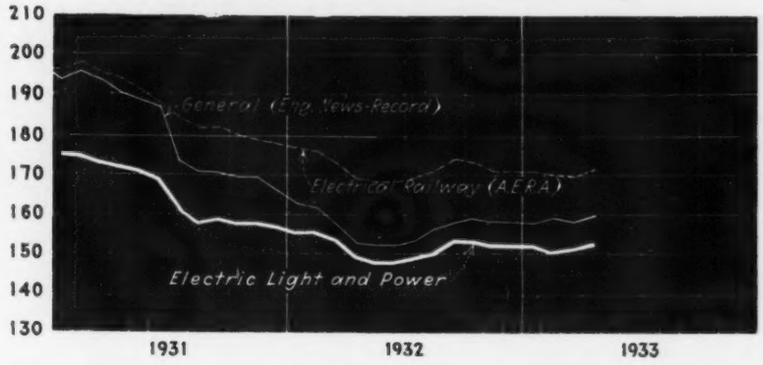
Referendum Petition Filed for Bone Power Bill

That the Bone bill, authorizing cities which own electric power plants to sell energy outside their limits, should have become a law (ELECTRICAL WORLD, March 18, page 340) does not, it seems, bring an end to its long and stormy career in the state of Washington.

A petition for a referendum has been filed by the Secretary of State, E. N. Hutchinson, and its sponsors have until June 7 to secure the necessary 30,000 signatures to assure a place on the ballot.

This petition was presented by the Taxpayers' Relief Committee, which set forth among other objections that the act would remove additional property from the tax roll and thus subject other property to further burdens. It was asserted that if municipalities can engage in the power business with profit they should pay their share of taxes.

Construction Costs Rising



Construction costs continued slightly upward during the past month, approximately to the level of last October, after a moderate sag during the winter. The rise contrasts with a moderate decline a year ago. It brings electrical construction costs up about 3 per cent compared with the same month of 1932. They remain 17 per cent under the five-year maximum. Indexes for earlier years were given in the issue of January 21, 1933.

Construction Cost Indexes: Electric Light and Power, Electric Railway and General

Base: 1913 = 100

	Electric Light and Power*	Electric Railway*	General *Engineering News-Record*
April, 1933....	153	172	160.2
March, 1933...	151	170†	158.4
February, 1933.	150	170†	159.3
January, 1933..	152	171†	158.4
April, 1932....	149	169	153.1
Last 5 yrs. high	185	205†	210.4
Month.....	Jan. '30	Dec., '29	Feb., '29
Last 5 yrs. low.	148	168†	152.2
Month.....	May, '32	May, '32	June, '32

*Computed by Albert S. Richey. †Revised.

Major New Construction This Week

Machine drives, heavy-duty motors, transformers, compressors and pumps will be required for new refinery at Houston, Tex., of Pan-American Petroleum & Transport Company. A $7,000,000 project.

Nantahala Power & Light Company, Bryson City, N. C., has authorized construction of transmission line to Sylva, N. C., and vicinity, about 30 miles. Cost over $40,000 with substation facilities.

General electrical equipment required for new brewery of Philip Zang Brewing & Manufacturing Company, Denver, Colo. A $600,000 project.

Oberlin, Ohio, is arranging fund of $250,000 for city-owned electric light and power plant.

Appleton Company, Anderson, N. C., plans expansion of cotton mill power plant. Estimated cost over $150,000.

Cushing, Okla., plans early purchase of equipment for city-owned electric light and power plant and electric distributing lines. Estimated cost over $200,000.

Public Service Electric & Gas Company, Newark, N. J., plans construction of two overhead transmission lines across Hackensack River near Jersey City, N. J., using steel towers for two 132-kv. open-wire crossings, each consisting of six 500,000-circ.mil copper conductors.

New York Metal Prices

	April 18, 1933 Cents per Pound	April 25, 1933 Cents per Pound
Copper, electrolytic..	5.37½	6.25
Lead, Am. S. & R. price	3.25	3.50
Antimony.....	5.60	6.125
Nickel ingot.....	35.00	35.00
Zinc, spot.....	3.50	4.05
Tin, Straits.....	25.75	30.00
Aluminum, 99 per cent.	23.30	23.30

Electrical Exports Up Slightly

Exports of electrical machinery as compiled by the Bureau of Foreign and Domestic Commerce show that March of this year was a better month than February, though a poorer one than March of last year. As reported the figures were: March, 1933, $2,732,276; February, 1933, $2,461,271, and, March, 1932, $4,654,495.

Allis-Chalmers Reports Loss

In the first quarter of 1933, Allis-Chalmers Manufacturing Company showed a loss, after all charges including interest on debentures, taxes and depreciation, of $869,986.77, as compared with

a loss of $936,395.31 for corresponding quarter a year ago. Billings to customers in the current quarter were only $2,691,992.14, as against $3,593,966.14 in like 1932 period. Bookings for the first quarter of 1933 amounted to $1,720,565.88, contrasted with $2,984,377.42 in the 1932 period. Unfilled orders March 31, 1933, aggregated $4,470,399.14, compared with $5,441,825.40 at the close of 1932.

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Tulare Votes "No" on Municipal

Voters of Tulare, Calif., at a recent municipal election defeated a proposed amendment to the city charter creating a municipal public utility department, and designed evidently for the purpose of acquiring the Tulare city portion of the Southern California Edison Company distributing system without first submitting the purchase plan to a vote of the citizens. The proposed amendment was defeated by a vote of 305 to 238. Only a majority vote was required for determination of the issue.

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New York Contractors Unite

Under the banner of "Council of Electrical Contractor Associations of Greater New York" various metropolitan electrical contractor groups have united for co-operation to enforce the city electrical code as written as well as to devise ways and means to make the electrical code more effective for the safeguarding of life and property. A. Lincoln Bush has been selected as chairman of the council.

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Arkansas Securities Law

Foreign and domestic public utilities operating in Arkansas have been advised by the securities division of the state Banking Department that a permit from that division is necessary to sell securities in the state. This authority was conferred by the 1933 Legislature. Formerly supervision was carried out by the Arkansas Railroad Commission, which was abolished by the recent Legislature.

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Associated Customer Shift

An apparent relocation of business organizations in its territory during the past year, involving a transfer from large cities to smaller communities, has been observed by the industrial development division of the Associated Gas & Electric system. In 1932 181 new industrial enterprises located in areas served by the Associated system, confined largely to the consumer goods group, such as textiles, wearing apparel, food products, reported the employment of 5,730 wage earners. During the year 170 existing industrial customers added 2,582 wage earners.

As to Rates——

• Seeking to force California utilities to reduce their rates in a wholesale manner, attempts have been made to secure the passage of a bill in the state Legislature which would compel reductions by gas, electric and telephone companies of 20 per cent. Constitutionality of the proposed legislation has been attacked by members of the California Railroad Commission, alleging it would compel utilities to accept a rate which would net less than the cost of the money invested.

• Thorough investigation of the rates, rules and regulations of the Central Arizona Light & Power Company, largest undertaking of its kind in the state, has been started by the Arizona Corporation Commission.

• Florida Power & Light Company has entered suit for a permanent injunction against the ordinance passed by the city Council of Miami reducing rates approximately 29 per cent. Hearings before a newly appointed master in chancery are expected to continue for several weeks.

• Not content with the recommended rate reductions of an engineering firm retained by the city (ELECTRICAL WORLD, April 8, page 436) and undismayed by the contention of the Louisville Gas & Electric Company that those recommendations could not be met by the company, the Louisville Board of Aldermen has proposed that even lower rates be instituted. The case seems definitely doomed to court action.

• Reductions in the rates now charged by all gas and electric utility corporations by at least 10 per cent have been urged in resolutions adopted by the Virginia League of Municipalities and formally communicated to the state Corporation Commission.

• Cuts of from 13.9 to 34.7 per cent have been offered with Public Service Commission approval by the Northern Indiana Power Company to certain Indiana towns.

• Evansville, Ind., has been given a "temporary" cut in electric rates of 10 per cent by the Southern Indiana Gas & Electric Company.

• Buffalo General Electric Company has filed with the New York Public Service Commission and received approval for, a new schedule of rates for that city which would reduce reconnection charges and gross minimum charges and would increase the minimum rating of appliances to be counted in arriving at the first two blocks in domestic and commercial rates.

• Confidently predicting aggregate savings to energy users of the city of New York of $25,000,000 a year, Aldermanic President McKee has sought and obtained an appropriation of $50,000 to finance action against the gas and electric companies. President George B. Cortelyou, speaking on behalf of the properties of the Consolidated Gas group, pointed to substantial and numerous reductions made in recent years by the companies. Mr. McKee, interim Mayor between the Walker and O'Brien régimes, is likely to be a candidate for Mayor at the fall election.

• Resolutions calling upon the Alabama Public Service Commission to lower utility rates in the state were adopted by the Alabama League of Municipalities at its two-day convention last week. "Immediate relief" is asked on the grounds that commodities and labor are lower in cost and utility rates still continue "at the peak."

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With the Legislators——

DISTRICT OF COLUMBIA—Having indorsed the principle of a plan advanced by the state of New York (ELECTRICAL WORLD, March 4, page 276), the District of Columbia Public Utilities Commission will ask Congress to authorize it to enter into proposed compacts with neighboring states concerning the interstate transmission of electricity and gas. The District government would have to obtain approval by Congress in general legislation.

NEBRASKA—Both houses of the Nebraska Legislature have passed a bill prohibiting electric power companies from including service charges and requiring all electric energy to be sold on the flat kilowatt basis. The bill does not affect Lincoln and Omaha, which have home rule charters. An act authorizing the organization of self-liquidating public power and irrigation districts which could finance their projects by Reconstruction Finance Corporation loans has been sent to the Governor for his signature, both houses having passed it.

OHIO—Several bills are being studied by the Ohio Senate utilities committee to permit the Public Utilities Commission to establish temporary rates whether or not rate questions are pending before it; to provide that when a utility appeals from a rate ordinance and loses it shall reimburse the municipality for its expenses in fighting the appeal; providing that utilities shall keep on file with the commission at all times up-to-date inventories; providing that the commission shall appoint an examiner to hear a rate question when the commission cannot begin hearing it within 60 days after it is filed; providing for the elimination of all service charges by utilities.

WEST VIRGINIA—At a conference with Governor Kump, a special House committee will ask that the House be allowed to consider legislation to revise laws for greater regulation of public utility rates and for control of the sale of utility stocks and other securities.

"Electricity at Work" to Be World Fair Feature

At the electric light and power industry exhibit of the Century of Progress Exposition in Chicago the dominant theme will be "Electricity at Work." Here will be presented in simple, colorful and easily understood form the multitudes of electric applications to industry, commerce, trade, community existence and household economy. How electricity is produced, transmitted over the countryside and converted to human needs also will be placed before the visitor in a manner never before attempted. In other words, it will be attractively visualized so that neither technical knowledge nor statistics are necessary to grasp the story.

Constructed in Chicago workrooms, the elements of the exhibit will soon be transported to the fair grounds. When in place this display will occupy 8,000 ft. of floor space in the electrical group of buildings at the fair. It will include what is said to be the largest diorama ever made, a composition 90 ft. long, portraying in miniature the complete projection of the electrical utility from mountainside to populous cities. Upward of 100 engineers, architects, modelmakers and skilled craftsmen have labored for months on this extraordinary undertaking, which combines technical perfection with pictorial art.

Also of interest will be the model farms, stores, factories, offices, schoolrooms, hospital operating rooms, beauty parlors, shops, household interiors, gardens and other smaller dioramas giving realistic visions of advanced and efficient methods of electric illumination. In addition there will be many full-sized rooms and workshops equipped with electrical appliances and lighting effects heretofore unknown to many people.

There will also be a series of models showing the progressive history of electrical and steam power development from the earliest records to the present day—an undertaking now tried for the first time, requiring a vast amount of research and craftsmanship of the most accurate fidelity. "Electricity at Work" has been made possible by contributions from a large number of electric light and power companies.

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33-Kv. Generators Total 200,000 Kw. Abroad

Though the highest voltage used in a commercial generator in this country remains 22 kv., foreign practice appears to be swinging rapidly to 33-36 kv. equipment. No less than 200,000 kw. is now devoted to such practice abroad. England, the Continent and South Africa offer conspicuous examples of allegiance to the newer conviction. The largest single 33-kv. unit is that destined for the Swansea (England) station. It is rated at 30,000 kw. and is now under construction.

According to J. Rosen, director C. A. Parsons & Company, Ltd., the next step to be looked for is 66 kv. Mr. Rosen sees the development of the concentric conductor principle bringing these rapidly within the range of possibility. The Electricity Commissioners of South Africa recently ordered a 35 kv. unit (ELECTRICAL WORLD, April 1, page 408).

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Over the Hills to the Power House

Many workmen have for several months labored to build one of the largest of dioramas that visitors to the Century of Progress Exposition may see the story of power generation, transmission, distribution and application in a working model that swings through a sequence of light and darkness to simulate the appearance of a world in the transition from day to night. This is the hydro-electric section under construction.

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Tennessee Basin 20 per Cent Developed, Says Department

Reporting upon the much-debated and none-to-well-understood Tennessee Valley project and the potentialities of the whole basin, the Department of the Interior states:

The total water-power resources of the basin are about 3,000,000 hp. available 50 per cent of the time, or about 2,500,000 hp. available 90 per cent of the time. On the basis of the present practice in the installation of waterwheels at developed water-power plants, about 5,000,000 hp. of waterwheels would be required in the development of all the water-power resources of the Tennessee River basin. The total capacity of the 46 water-power plants in the basin that have 100 hp. or more at present is 876,000 hp.; therefore less than 20 per cent of the total water-power resources of the basin has been developed.

The primary use of water power in the basin is in the generation of electricity for light and power. About 700,000 hp. is used to drive the generators of public-utility plants and about 175,000 hp. is used by manufacturing plants, many of which generate electric power for their own use. The electricity generated by public-utility power plants is distributed over the basin by means of transmission lines with a total length between 3,000 and 4,000 miles.

The principal uses of power at the present time are about as follows:

	Per Cent
Lighting and domestic	43
Cement, clay products, ore, mines and quarries	11
Electrochemical foundries, boiler and machine shops	20
Enamelware, agricultural implements, furniture, and paper	6
Textile mills	6
Food and dairy products and ice plants	4
Miscellaneous	10
	100

Increase in the demand for power, concludes the department's statement, will come through increased urban and rural domestic use, the development of industries in the states composing the basin and in the surrounding states and the electrification of railroads where traffic conditions will justify the cost. In all three lines there are large possibilities, the department observes.

EDITORIALS

L.W.W.MORROW
Editor

Do You Believe in This Philosophy of Government?

THE greatest and gravest issue in our history has developed in Washington. There is no mistaking the fact that the administration is embarking upon a legislative program to back its philosophy that it is the duty of government to care for the economic and social welfare of every citizen through direct governmental intervention and direction. This used to be called socialism. This philosphy embodies a complete social and economic revolution, and yet it is taking form through the passage of permissive legislation that gives the President complete power to dictate the national economy. As stated by John W. Owens, editor of the Baltimore *Sun*: "Never in any constitutional government was such power given to one man to manipulate and even destroy private property in the name of the common weal."

Two parts of this program are now under way. The first involves the departure from the gold standard and the passage of legislation to give the President permissive power to use any and all methods of inflation if he so desires. And no one knows what degree of inflation may be had or the methods that will be used—the administration is silent. Is such a situation reassuring to business and labor? Who dares to make intelligent commitments while sitting on this dynamite, that may explode credit and purchasing power at any instant?

EQUALLY serious and vital is the idea in the Perkins bill. It proposes a planned government economy through the dictation to industry of production, wages and prices. However vague in detail, the intent is to abandon the principle of unbridled competition under anti-trust laws and replace it with the principle that political dictatorship of industry is the only solution to our economic and social problems. Is it necessary or even advisable to accept this left-wing idea of the administration? Cannot we first modify the anti-trust laws, permit pledged trade associations to develop business plans and practices under governmental supervision and then put the power of enforcement back of the programs developed by industry in consultation with the government? We think industry can do its own job best and that it should be permitted to act for itself. We think the road to disaster is to put complete control of industry into the necessarily incompetent hands of politicians.

THE administration is creating a new economy that has its beginnings in the Columbia school of economic thought. We believe that industry should be consulted and should speak out when a theoretical philosophy promises to become powerful and active through the agency of legislation that will change completely the past conception of our American roads to progress. We urge that industry participate in this creative work and that it act with a full realization of the potential effects of the complete adoption of the administration's program.

We have no traditions or inhibitions to overcome and welcome logical changes, but we believe these changes should result from the democratic procedure of intelligent debate and analysis, and not from a blind faith in leadership that comes from thoughtless desperation. It is time to think and act now, and not after the proposed legislation becomes law.

Fourteen point program for spending to save

SHYING at expenditures may mean running away from savings. After making all the safe savings that can be made without sending new dollars as bait to lure added savings, the time comes when service and stabilized operations require some outlay further to improve the showing. Instances enough exist where a moderate expenditure will pave the way to proportionately large economies if the guardian of the exchequer will only listen and the operating staff will only have the courage to buck the blind edict—"not a dollar." One operator lists the following points as among those where the best job could probably be done first and easiest:

Only a few dollars for fuel meters, even though fuel be cheap, would pay. A turbine-turning device would save steam on machines now kept running and warm. Damage saved would pay for differential or fault protection on buses. The same is true of high-speed relays. Ditto for high-speed breakers. One severe outage will more than offset the cost of periodic test of line insulators. Getting a bad bushing off the bus side of an oil switch before it wrecks the bus or the breaker will cover the testing cost for a whole year. Modern braces, guys, etc., will pay for themselves in averted damage to conductors and insulators on medium-voltage lines. Life of paint coatings can be doubled by spending less than the saving in sand-blast equipment to prepare the surface properly. Even such a simple thing as replacing the timing mechanism in the timers for primary feeders will pay in improved service. Five-cent copper gives the chance of a generation to lay the foundation for secondary copper adequate to meet the loads of the immediate future.

Recent developments in regulation bring the problem of voltage regulation on rural and semi-rural lines where it will have to be to meet the trend of appliance loading. Energy diversion is so serious a problem that the expense of modern metering methods can easily be offset in a few months by the revenue reclaimed. On the accounting side there is no better time to install a cost system that will enable control of costs in plant, transmission and distribution.

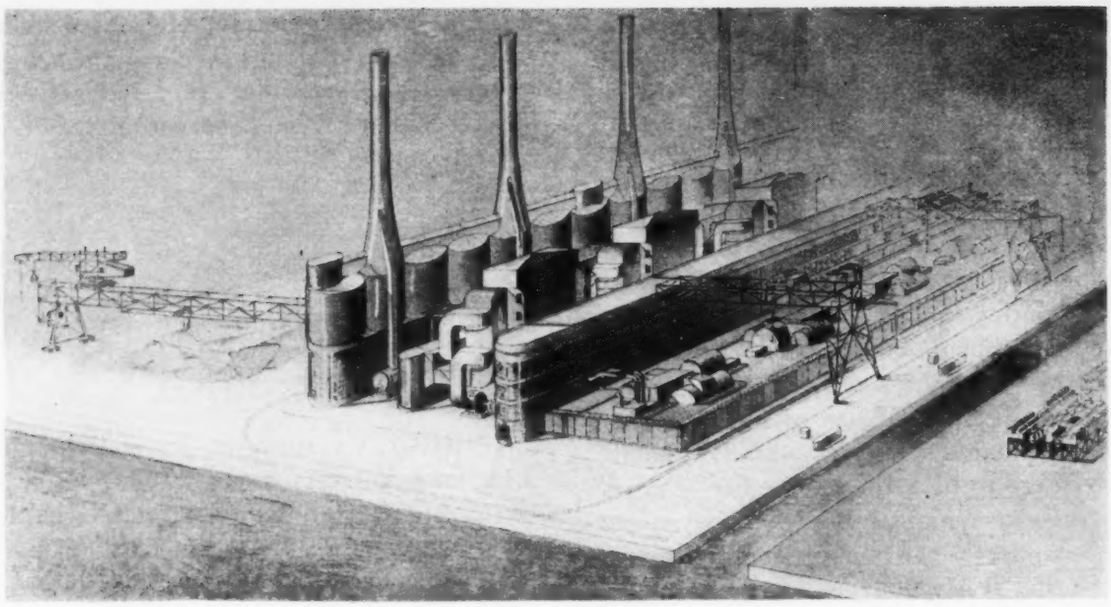
The burden is on the respective operating departments to prove the virtues of what each advocates. The burden is then on the management to weigh these tangible and demonstrable items against the things they imagine are going to happen to squeeze out every inch of breathing space between revenue and outgo.

Street lighting and insurance costs

A RECENT study of street lighting experience suggests a neglected relationship between highway illumination and insurance. In 1931 more than 35,000 people were killed and more than 1,000,000 were injured in automobile accidents. City traffic is 20 per cent at night and country traffic is 10 per cent after dark and 40 per cent of all accidents occur at night. The insurance companies pay out some $300,000,000 on those accidents and the full loss is probably $2,500,000,000. The annual loss for burglary and theft is close to $250,000,000 and most of this comes at night. It is estimated that 35 per cent of all night accidents are due to poor light and that good street illumination would save $275,000,000 in the costs of traffic accidents and crime. These figures are all based on 1931.

Now the present total expenditure for all street lighting is $88,000,000 and it would probably require another $100,000,000 to light the streets adequately. It is therefore argued that it would be profitable to raise the standards of illumination for protective purposes and save for the public this $275,000,000 now charged to poor light. And despite the fact that the average citizen who wasn't killed last year and had no accident in his family looks upon the suggestion that another $100,000,000 be spent by the cities with misgivings, there is food for thought in it.

It is interesting to consider what the effect of such an improvement might be on the city finances, through a decreased expense for police and hospital service. And it also raises the question of what the householder might save on reduced rates for burglary insurance on his home and theft and accident insurance on his car. Would he save more than his proportion of the increased cost of lighting? It is all theoretical speculation at present, but there is enough involved to justify a bit of serious research.



Unit Generating Station Combines Reliability with Economy

By J. E. GOODALE*

Electrical Engineer
New York & Queens Electric Light & Power Company,
Flushing, N. Y.

- No "power house."
- Only walkways and stairs on boilers housed.
- Only a hydrogen shell provided for alternators.
- No generator bus. No steam headers.
- 1,200-lb. turbine 1,400-lb. boilers.
- All auxiliaries motor-driven.
- Multi-secondary auto-transformers afford bus equivalent and reactance.
- Less than $55 per kilowatt, excluding land and coal-handling facilities.

IN CONSIDERING preliminary designs for the proposed Astoria generating station on Flushing Bay an attempt was made to reduce generating cost to a minimum without sacrificing station reliability. Most stations built heretofore have been designed with considerable flexibility in steam supply and electrical connections in order that the loss of one or more boilers or machines may not affect operation of the transmission system. Such flexibility involves appreciable cost and is somewhat questionable from the viewpoint of station reliability, since interconnecting the boilers and generators might result in an entire station shutdown in the event of a major catastrophe.

In considering the proposed Astoria station it was felt that the present-day reliability of boilers and turbo-generators would allow the adoption of a unit design which would assign each boiler to a turbine without interconnection of the steam supply. Although the plans call for interconnecting the generators, the interconnections are made with a multiplicity of metallic sheathed cables in separate ducts which can better be considered as a part of the transmission system rather than a part of the station. By adequate spacing of units the station could be considered as made up of several one-unit stations with no inter-relation except at the coal pile.

Considerable saving was afforded by the use of outdoor type boilers and turbo-alternators which eliminated all building construction, except that required for a service building and a machine shop. The service building contains the necessary offices and electrical control rooms. In one design the turbine auxiliaries are located in the basement of the service building and in another design the turbine auxiliaries are located in a basement beneath the turbine. The units are arranged side by side in such a way that similar component parts form rows parallel to the waterfront.

The machines are 200,000-kw., triple-tandem compound, 1,200-lb. units with hydrogen-cooled generators. Each machine is supplied from a single 1,400-lb. boiler fired with the unit system of pulverized fuel and capable of generating 1,700,000 lb. of steam per hour. The generators are rated at 16,500 volts, 200,000 kw and 250,000 kva. The ultimate station would have nine such units.

Paper presented at Power Group meeting, New York Section, A.I.E.E., April 13, 1933.

The site of the proposed station lies adjacent to the Astoria gas plant of the Consolidated Gas Company in Astoria, Queens. Existing coal-handling facilities, consisting of bridge towers and belt conveyers running parallel with the waterfront, are incorporated in the design. A storage area under the bridge towers is sufficient to store 130,000 tons of coal. The bridge towers can be used to take coal from the storage area or to unload boats along the dock. Belts on the bridges are used for transporting the coal from the receiving hopper to the storage area or to the traveling belts which feed the coal breakers. Conveyors carry the coal from the breakers up to a traveling belt above the coal silos and automatic tripping devices make it possible for this belt to deliver the broken coal to any desired silo. The coal is fed to the pulverizers from the coal silos by gravity. The completed station would have three bridge towers, one stocking bridge tower for storage purposes, two conveyor belts for carrying coal from the bridge towers to the coal breakers, four coal breakers, two elevators for carrying the coal from the breakers to the station distribution belts and two distribution belts for distributing broken coal to the coal silos. Each boiler is provided with three 600-ton coal silos, three suction type coal pulverizers and six drag feeders.

Motor-driven auxiliaries exclusively

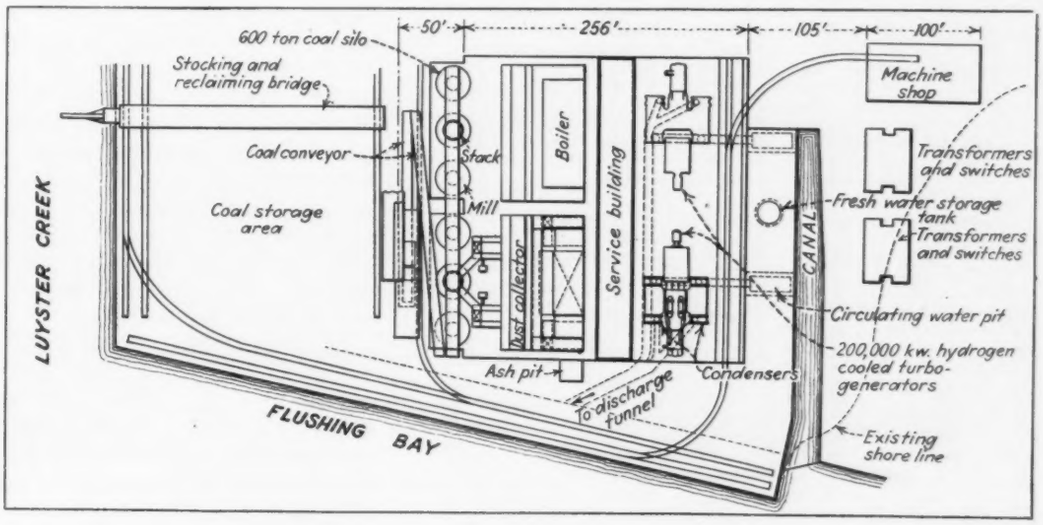
All auxiliaries throughout the station are designed for motor drive. Details on the method of fan control have not been definitely worked out. The fans are equipped with ball bearings in order to eliminate the need for bearing cooling water which might freeze due to the fans not being housed. The condenser circulating water pumps are located along the turbine room floor opposite the boilers and take the water from an intake canal running parallel to the waterfront. One circulating pump, one revolving screen and one condenser discharge duct are provided for each unit.

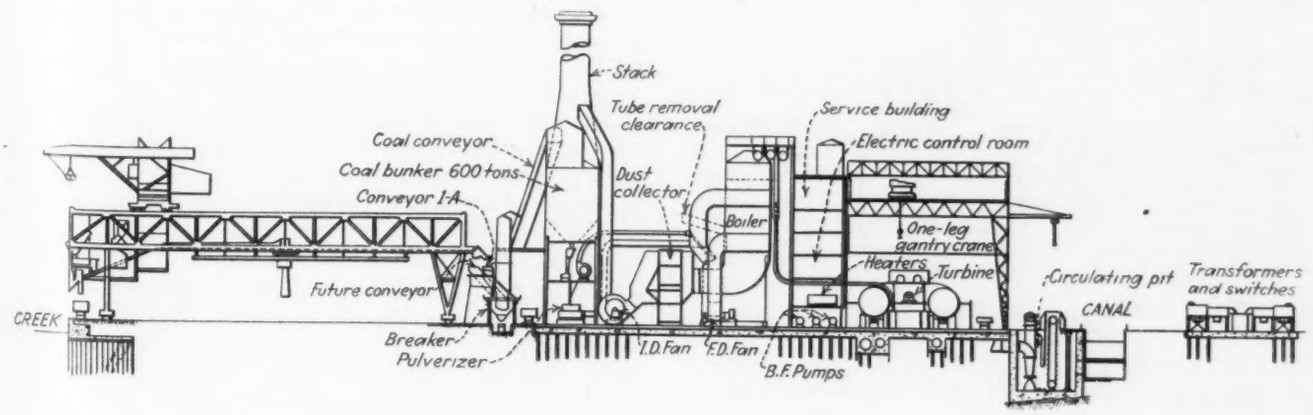
The condensate (Fig. 3) is pumped from the condenser through the air ejector condenser, generator air cooler and low-pressure heater. On the discharge side of the low-pressure heater it is joined with the condensate from all heaters and the surge tank, after which it passes through a primary feed pump discharging at 600 lb. pressure, three high-pressure heaters in cascade, secondary feed pumps discharging at 1,600 lb. pressure and the economizer into the boiler.

An air heater raises the temperature of the air to approximately 500 deg. before it is passed into the boilers. The gases leave the boiler at the top of each side wall, then pass downward through the air preheater, through the dust collectors and into the induced-draft fans. The forced-draft fans pass the air vertically up the air preheaters, around to the front of the boiler and then through the secondary air openings around the burners. Each furnace has a volume of approximately 45,000 cu.ft. and a heat release of 48,000 B.t.u. per cubic foot when the unit is generating 1,700,000 lb. per hour. Walkways have been included around each boiler at all levels, with stairways between levels completely inclosed by corrugated sheet metal. The boilers are not otherwise housed. Inclosed walkways connect the walk-

Figs. 1 and 2—Straight line from coal to outgoing lines

Starting from the waterfront (Figs. 1 and 2) we have the coal-handling facilities, the coal breakers, 600-ton coal silos, boiler stacks, pulverizing mills, induced-draft fans, boilers, forced-draft fans, service building, turbine floor, cooling water circulating pumps, cooling water intake canal and transformers and outdoor switching. A single gantry crane is provided for maintenance work on all turbines.





way system around the boilers to the service building so that the watch engineer may make his rounds between the steam control room and the boilers without passing outdoors. The burner platform and a platform at the drum level are also inclosed to facilitate observations of the burners and the gage glasses during inclement weather.

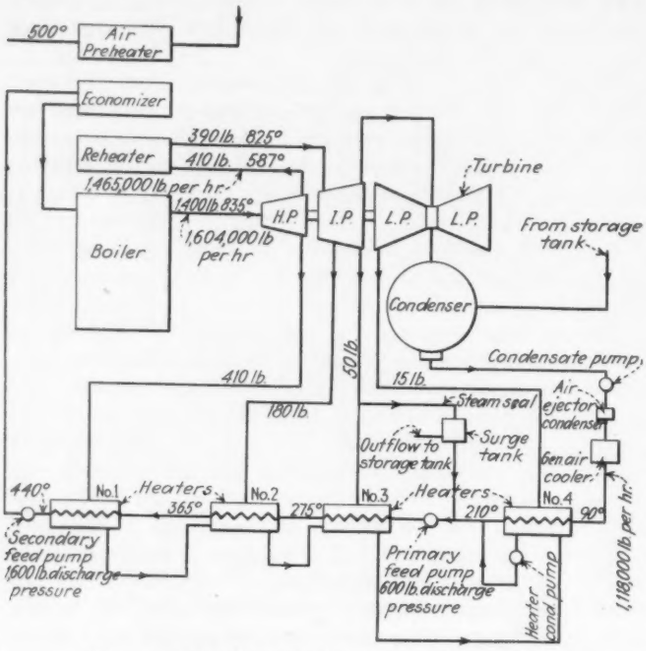


Fig. 3—Bleeding for heaters at five points

The high-pressure cylinder of the turbine is bled into the intermediate pressure cylinder through a reheater, entering the reheater at 410 lb., 587 deg. and leaving at 390 lb., 825 deg. The high-pressure cylinder is bled at a second 410-lb. point, from which steam is passed through the three high-pressure heaters in series and the low-pressure heater, after which it is mixed with the condensate which has passed from the condenser through the low-pressure heater. The intermediate cylinder is bled at three points, one feeding No. 2 high-pressure heater, one feeding No. 3 high-pressure heater and the storage tank and one feeding into the condenser. The low-pressure cylinder is bled at one point for supply to the low-pressure heater. The storage tank discharges into the condenser.

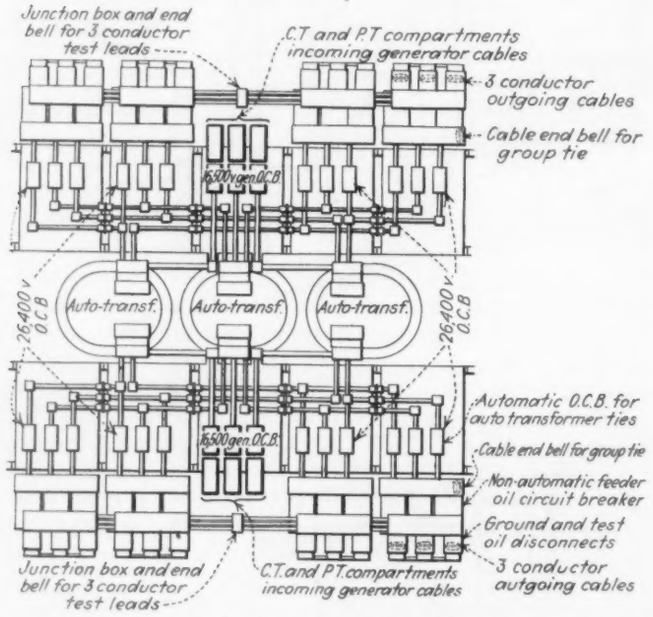

Junction box and end bell for 3 conductor test leads
C.T. and P.T. compartments incoming generator cables
3 conductor outgoing cables
Cable end bell for group tie
6500 gen. O.C.B.
26400 v O.C.B.
Auto-transf.
Auto-transf.
Auto-transf.
26400 v O.C.B.
Automatic O.C.B. for auto transformer ties
6500 gen. O.C.B.
Cable end bell for group tie
Non-automatic feeder oil circuit breaker
Ground and test oil disconnects
Junction box and end bell for 3 conductor test leads
C.T. and P.T. compartments incoming generator cables
3 conductor outgoing cables

Fig. 4—Switches are attached to the generator auto-transformers

Long electrical connections on the load side of these transformers eliminated. All switching is of the metal-clad outdoor type.

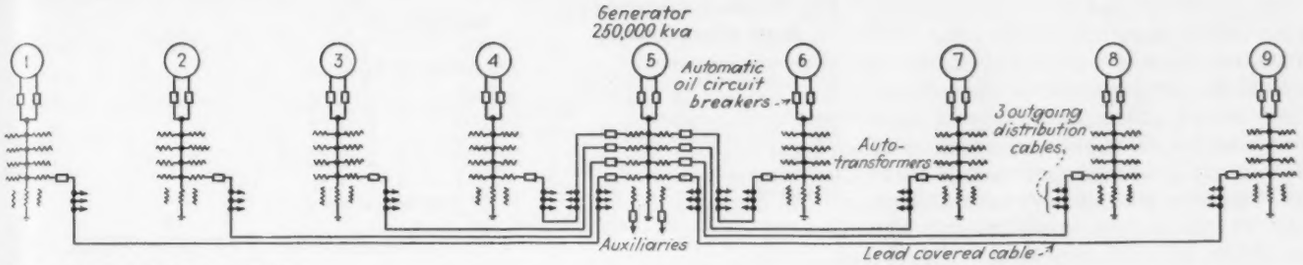
To eliminate the necessity of a water tender, a periscope is run from the gage glasses down to the steam control room to permit observation of the water level from the latter location. In addition to the periscope there is also installed in the control room a remote drum level indicator. The flow of water to each boiler is controlled automatically by a throttle type Smoot valve located in a 12-in. high pressure feed line. In event of trouble with the master control the control of the valve can be taken over by the steam control room operator manipulating the solenoid-operated pilot valve. It is expected that there will be far less difficulty with feedwater regulation than is experienced at the present time on 400-lb. operation because of the smaller changes in water density at the higher pressure for the same load change. Practically all 1,400-lb. plants report a much more stable drum level than had been experienced on 400-lb. operation. In order to eliminate all possibilities of freezing of drain lines during cold weather, drains are brought down inside of the boiler casing and run through heated trenches to points of disposal. The safety valves are inclosed by steel lagging.

No fear of freezing in winter

In the event of shutdown during cold weather for periods of a day or less it is believed that the setting will retain sufficient heat to prevent the boiler water temperature from lowering to the freezing point. If a long shutdown is occasioned during extreme cold weather the boiler can be emptied of water immediately and not filled until the unit is ready to return to service. Additional iron treatment can be added at the time to absorb the oxygen. Approximately 374,000 lb. of water is contained in each boiler. Thus the cost of the water is negligible. To facilitate working inside the boiler during cold weather it is planned to set up on the slag bottom three or four steam radiators and connect them temporarily to outlets located adjacent to the boiler. These radiators will receive their steam supply from a heating line running in a floor trench between the oil-fired central heating plant and the mill house.

Generators are hydrogen-cooled. No definite design for adaptation of hydrogen to cooling has been worked out for this station, but much literature is available on this subject and some experience has been acquired in the use of hydrogen cooling for smaller generators and synchronous condensers. No particular difficulty is contemplated in this connection.

In order to operate the turbo-generator outdoors and at the same time eliminate the possibility of troubles with oil lubricating systems, steam drains and water drains some steel inclosures have been added at certain points. It is contemplated to have the inclosure made up of four removable sections, one of which completely covers the governing valve, the high-pressure cylinder, some of the bearings and the 400-lb. cylinder. Another section covers some more of the bearings and a part of the cross-over pipes, the third section covering the bearings between the low-pressure cylinder and the generator and the fourth section covering the outboard generator bearing and the exciter. No housing is provided about the shell of the hydrogen-cooled generator. Explosion doors are provided in the top of the generator shell to prevent too



Each of the secondary windings of each auto-transformer is tied through automatic oil circuit breakers to secondary windings of the remaining eight auto-transformers. To each one of these 64 ties is connected a group of six distribution feeders having non-automatic oil circuit breakers and ground and test oil disconnects. Outgoing feeders from each tie are arranged in two groups, three feeders being located at each of the two auto-transformers to which the tie connects; 24 feeders emanating from each auto-transformer location are installed in two separate duct banks, these duct banks being independent of the other duct banks. Arrangement of the 64 ties is such that when all switches feeding the groups are closed each generating unit is connected to every other unit in the station.

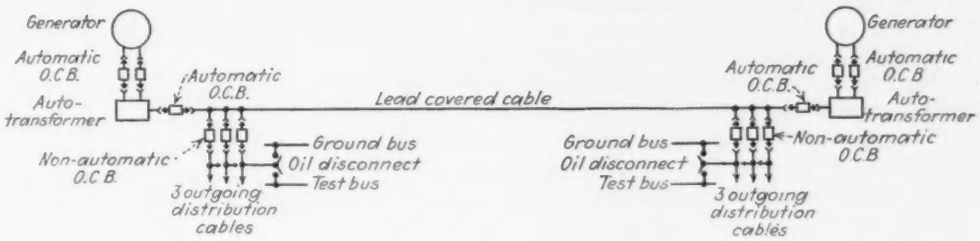


Fig. 5—Every generator tied to every other through auto-transformers

high pressures from rupturing the casing in event the gas mixture within a generator should reach an explosive ratio.

Access to all inclosures are from the turbine room basement by stairways, all inclosures being sufficiently large to allow passage between the inclosure wall and the part of the machine inclosed. Thus in extreme weather there is no necessity for the turbine room watch engineers to be outdoors. The radiation from the machine plus the chimney action from the turbine room basement can maintain the inclosures at temperatures above freezing. Ventilators are provided in the sides of the inclosures for ventilation in warm weather. All turbine auxiliaries, including normal oil, emergency oil and shaft-lifting pumps, are located in the turbine room basement. In event of trouble with the remote operation of the throttle valve, manual operation can be executed from the turbine room basement floor.

The arrangement of the electrical connections and switching is quite novel in that the equivalent of a solid bus is obtained without excessive short-circuit currents and without the use of series reactors. The duties imposed upon the breakers for various fault locations are as follows:

Location of Breaker	Current-Carrying Capacity Amp.	Interrupting Capacity Kva.	Location of Fault	—Duty After 0.25 Second— No Feed-back from Network Kva.	100 Per Cent Feed-back from Network Kva.
Generator	5,000	2,500,000	Between generator and breaker	2,600,000	3,200,000*
Generator	5,000	2,500,000	Between transformer and breaker	850,000	....
Inter-bank tie	1,200	1,000,000	Between breaker and auto-transformer	400,000	1,300,000

*Sequential operation will reduce these duties by approximately 600,000 kva.

No automatic oil circuit breakers are used on the distribution circuits, which, in effect, makes each group a single feeder of 62,500 kva. capacity or one-quarter the rating of one generating unit. The use of feeders of this capacity is considered permissible when the system load and generating units are correspondingly large, especially when one group is made up of several distribution circuits which can be diversified over several districts. Automatic oil circuit breakers are used between

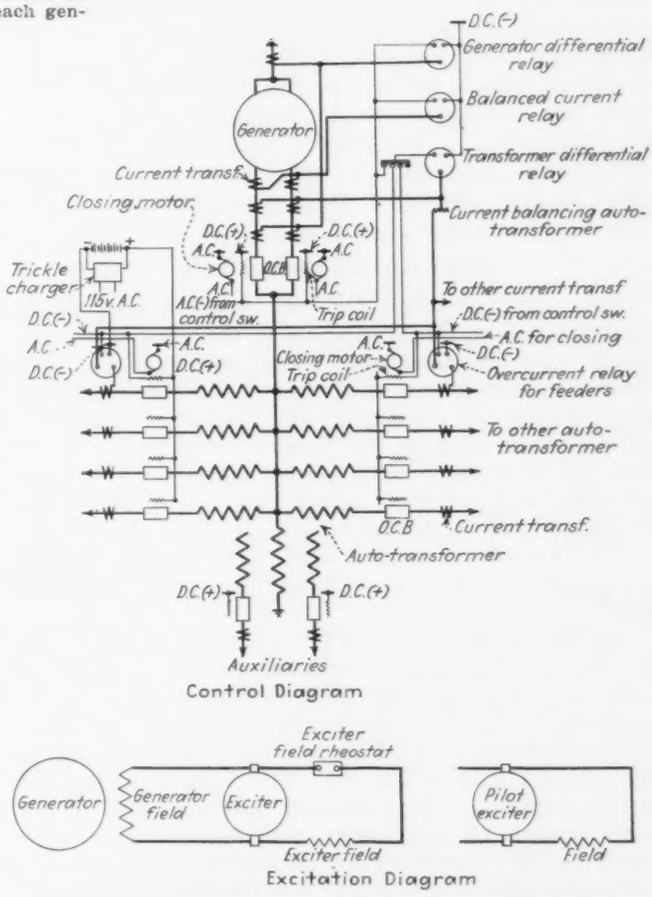


Fig. 6—Main generator field rheostat eliminated

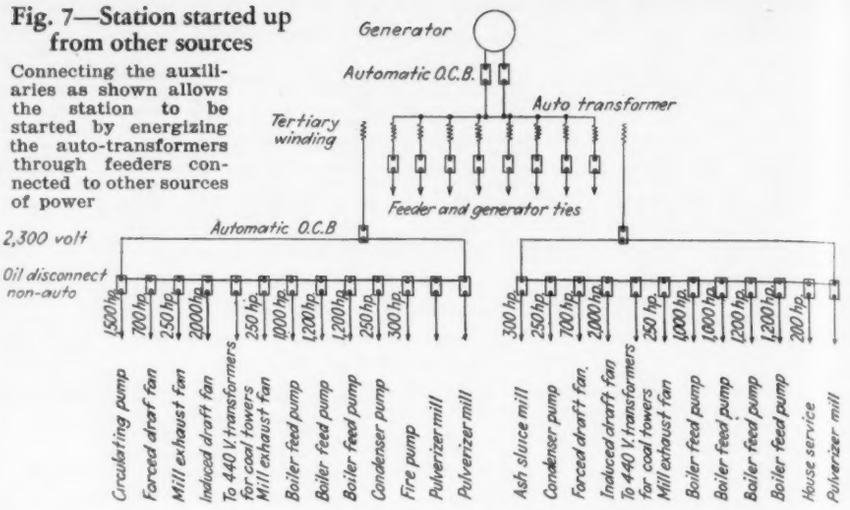
A unit excitation system, consisting of a direct-connected shaft-driven exciter with pilot exciter for each machine, was chosen as fulfilling all the requirements of simplicity, reliability, etc. This arrangement also eliminates a main generator field rheostat which has proved to be a source of trouble as well as a source of considerable energy loss.

each generator and the corresponding auto-transformer in order that the auto-transformer can be kept in service while the generator is shut down. This allows all feeder groups to have two sources of supply irrespective of how many generators are out of service, and also gives a very reliable supply to the station auxiliaries. The windings of each generator (Fig. 5) are connected through the automatic oil circuit breakers to the primary of an auto-transformer having eight secondary windings, 27.6 kv., and two tertiary windings, 2.3 kv., for the auxiliary power supply.

The auto-transformers are single phase, rated at 83,333 kva., and are suitable for unbalanced loading. The normal load on each winding is 31,200 kva. The worst case of unbalanced load, because of units being out of service, imposes a maximum load of 40,000 kva. on some of the windings. The efficiency of the auto-transformer at full load with balanced loading and tertiaries idle is estimated as 99.75 per cent. In order to occupy as little floor space as possible the transformers have been designed with the radiators mounted above the transformer. The conduits between the auto-transformer and generator are installed across the intake canal in such a manner as to serve as a bridge for crossing the canal.

Fig. 7—Station started up from other sources

Connecting the auxiliaries as shown allows the station to be started by energizing the auto-transformers through feeders connected to other sources of power



Short runs for control cable

The protective relays for each unit are mounted in weatherproof housings adjacent to the equipment with which they are associated. This will eliminate long conduit runs at quite a saving in cost. The relay protection for each unit consists of generator and transformer differential protection and balance relay protection to take care of short circuits between turns. The ties are provided with overload relays only. The oil circuit breakers are motor-operated (Fig. 6). For closing 208-volt a.c. network service is used. For tripping a small storage battery and trickle charger is provided for each unit.

The two tertiary windings in the auto-transformers are for the auxiliary power units, of which there are no duplicates, thus carrying the unit system down to the auxiliaries (Fig. 7). The auxiliaries have been divided into two groups, each group forming a loop supplied by one of the tertiaries, and controlled by an automatic oil circuit breaker. The auxiliaries are connected to the loop through oil disconnects, thus eliminating complicated control connections and conduit runs. Should any section of cable in a loop fail, it is planned to disconnect the faulty section and restore service immediately. All motors 50 hp. and larger will be 2,300 volts. A 208-volt, a.c. network is provided for lighting and motors smaller than 50 hp.

In designing the excitation system (Fig. 6), various factors, such as simplicity of connections, reliability and the effect of trouble on the other units, were taken into consideration.

Electrical switchboards and steam control boards for each unit are located in the associated control room. All non-essential instruments have been eliminated. All switches and instruments on the electrical switchboards are of the miniature type and are arranged to form a miniature bus. The control switch for the ground and test switches is interlocked with the feeder breaker control switch so that the feeder cannot be connected to the ground or test bus with the feeder breaker closed. Signal lights show the position of the main breaker and ground and test oil disconnects. It has been suggested that each control room be equipped with a television transmitter and that a central control room be established with vision receivers so that the chief operator can view all nine control boards from a central point. A loud-speaker arrangement can be provided so that he can talk to the nine operators at the same time.

Necessary machine shop equipment, oil purification and high-voltage testing equipment have also been included in the design of the station.

The estimated cost of building this station, exclusive of land and existing coal-handling facilities, is $44.21 per kilowatt for the steam equipment and $10.22 per kilowatt for the electrical equipment. The boilers and generators can be housed at an additional cost of $1.65 per kilowatt. The total cost without a building is then $54.43 and with a building $56.06.

It should be understood that the details as described are all preliminary and that a more detailed study of each of the above features may require modification or change in design.

▼

Attic Fans Cool Houses in Summer

Attic ventilating fans have been found very helpful by the New Orleans Public Service Company in removing the sun's heat absorbed by the roofs and side walls of residences during the summer and in stimulating air circulation through the house, providing the attic door is left open. Data available from existing installations indicate that the house temperature can be lowered 5 to 10 deg. at nightfall when the outside temperature drops because of the circulation created. It is pointed out that this method of providing air comfort can be sold where it is impossible to place the more expensive air-conditioning equipment, although the results are not

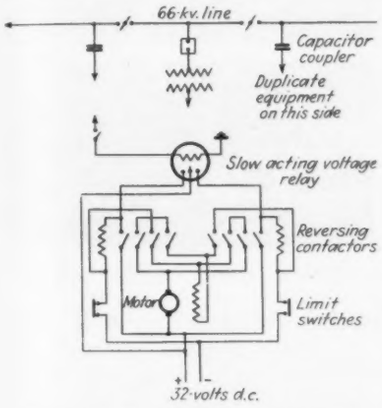
comparable. However, the attic fan is creating a wider interest in home ventilation, and is paving the way to public acceptance of air conditioning in its more refined form.

▼

Sectionalizing Switches Automatically Maintain Service

By H. L. SAMPSON
Southern California Edison Company, Ltd.

To maintain adequate service for a small town which is served from a bank of transformers tapped between pole top switches in a 66-kv. transmission line, the Southern California Edison Company has adopted automatic sectionalizing control for the air-break switches. While the application* is not new the simplicity of the equipment and its characteristics are of interest.



Control diagram for automatic sectionalizing equipment

The substation is located midway on a 40-mile 60-kv. tie between two substations, both of which are equipped with automatic oil circuit breakers. A line failure in this 40-mile section leaves the town served by the substation without power until the line can be patrolled and trouble cleared.

To reduce the time of outage, motor operators were installed on each of the pole top switches, operating power being obtained from a small 32-volt storage battery. As shown in the accompanying diagram, each motor operator is actuated through a slow-acting voltage relay connected through a capacitor coupler to the line side of the air-break switch.

In case of line failure the voltage relays each close a set of contacts which start the motors and open their respective pole top switches. As the automatic breakers at the two end substations are closed one will remain in, depending upon which section is at fault. The voltage relay at the substation serving the town will then cause its switch to close, thereby picking up the load. It will be noted that contacts on the reversing contactors seal in after being energized through the voltage relay, so that, once started, switch operations will be completed. A mechanical interlock is installed between the reversing contactors.

Because of the simplicity of the equipment itself and the fact that potential transformers are replaced by coupling capacitors the control equipment is relatively inexpensive. Equipping existing sectionalizing switches with the devices presents no particular problem and such applications will eliminate lengthy interruptions to service.

*See "Automatic Air-Break Switch Reduces Outage Time," ELECTRICAL WORLD, October 15, 1932, page 541.

▼

Compares Outputs from Coal, Oil, Gas

Greatly increased efficiency in the use of fuels of all kinds and a much larger output than formerly from gas, while coal remains the predominant source of heat, are disclosed in a recent bulletin of the Department of the Interior. This gives comparative figures on fuel consumption in public utility power plants for 1926 and 1931, abstracted in the accompanying tables. In the latter year about 82 per cent of the fuel-generated energy came from coal, 4 from oil, 14 from gas and less than 1 per cent from wood. In 1926 the corresponding figures were 90, 5, 5 and less than 1.

The gain in efficiency of utilization during the five-year period was, in per cent, as follows: Coal, 25; oil, 35; gas, 33. These figures are for the country as a whole. As will be seen from the tables, there were considerable variations between the different geographical regions.

The best fuel rate during 1931 for coal was about 1.00 lb. per kilowatt-hour; for oil, 430 kw.-hr. per barrel; for gas, 11.4 cu.ft. per kilowatt-hour. These efficiencies, it is pointed out, have been reached under unfavorable load conditions and low cost of fuels.

Based on the average fuel rates for the United States one ton of coal is equivalent to 3.9 barrels of oil or to 21,800 cu.ft of gas.

Output by Use of Different Fuels, 1931

Region	Total Inc. Hydro	Output from Fuels, Million Kw.-Hr. Total	Coal	Oil	Gas	Wood	Per Cent of Total Coal	Oil	Gas	Wood
United States....	91,727	61,124	49,857	2,670	8,251	346	82	4	14	*
New England....	6,389	3,882	3,335	547	0	...	86	14	0	0
Middle Atlantic..	24,403	18,468	18,351	113	4	...	99	1	0	0
East No. Central.	20,638	18,643	18,279	56	304	4	98	0	2	*
West No. Central	5,884	4,537	3,610	272	649	6	80	6	14	*
South Atlantic...	10,197	5,352	4,552	706	87	7	85	13	2	*
East So. Central..	3,907	802	572	28	188	14	72	4	24	*
West So. Central.	4,500	4,423	655	172	3,580	16	15	4	81	*
Mountain.....	3,265	835	503	156	163	13	61	19	20	*
Pacific.....	12,545	4,182	0	621	3,275	286	0	15	78	7

*Less than 1 per cent.

Consumption of Fuels in 1931 and Comparison of Fuel Rates, 1926 and 1931

Region	Quantity, 1931 (Thousands) Coal Net Tons	Oil Bbl.	Gas M.Cu.Ft.	Fuel per Kw.-Hr. Coal Lb.	Oil Bbl.	Gas Cu.Ft.	Ratio of Rate to 1926 Coal	Oil	Gas
United States...	38,717	8,114	139,350	1.55	0.00304	16.9	0.80	0.74	0.76
New England...	2,398	1,569	0	1.44	0.00287	....	0.83	0.86	....
Middle Atlantic.	13,003	333	79	1.42	0.00303	18.9	0.81	0.64	0.86
East No. Central	13,831	166	5,542	1.51	0.00299	18.2	0.77	0.89	0.76
West No. Central	3,927	842	14,036	2.18	0.00311	21.6	0.76	0.62	0.98
South Atlantic..	3,530	2,175	1,312	1.55	0.00308	15.1	0.85	0.71	0.41
East So. Central	684	93	3,772	2.39	0.0334	20.1	0.99	0.77	....
West So. Central	716	556	65,401	2.19	0.00324	18.3	0.94	0.82	0.76
Mountain.....	628	420	3,301	2.49	0.00268	20.2	0.94	0.60	0.36
Pacific.....	0	1,960	45,907	....	0.00315	14.0	....	0.78	0.81

Western Activity Near Last Year's

Reports of electrical energy consumption in industrial plants in the South and West reflect the effects of the financial disturbances during March. In addition they are probably affected by delayed reading of meters at the end of February. This seems to be the only explanation of the annual apparent increase of industrial activity in the short month and the succeeding recession.

In the South the two influences contributed to a decrease, in the weighted index, of 13 per cent from February, against 11 per cent in 1932, bringing it 7 per cent under that for March of last year. In February the decrease from 1932 was 4.5 per cent.

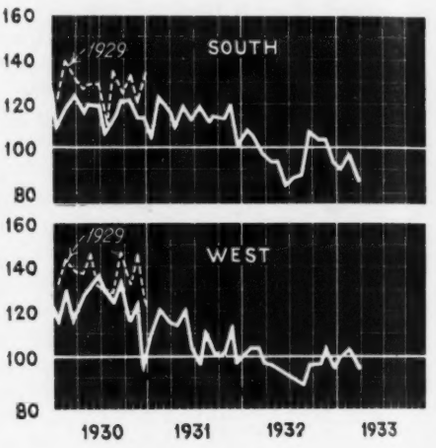
Despite the adverse influences an upward movement is to be noted in the stone, clay and glass industry. In the returns this was observed especially in the extreme South; in other parts of the section the changes were less consistent. Activity in textiles decreased, in general, although in some localities there was a gain, approximately proportional to the increased number of working days in March. Metals and forest products fell off sharply; the metal-working industry, however, maintained an increase over the very low figures of 1932.

The West made a somewhat better showing. The decline from February was only 6 per cent and the general level approached last year's. The deficiency was so small that returns still to be received may wipe it out entirely, if they happen to be favorable.

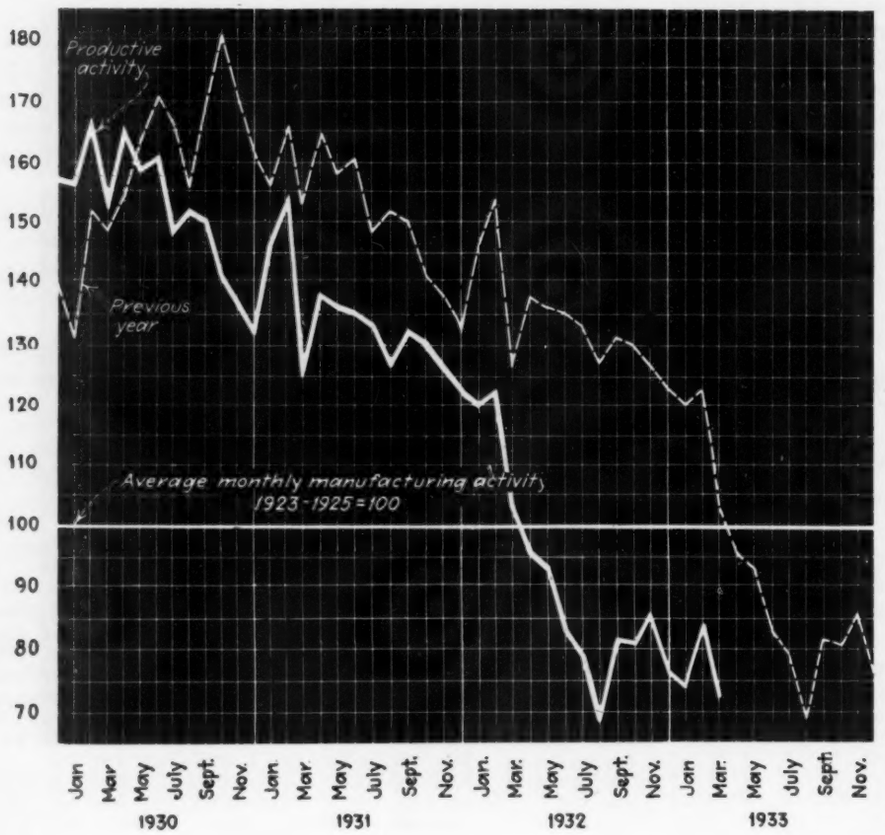
The metals group fully held the level of the two preceding months and again surpassed last year's figure, but is operating at only 22 per cent of the rate four years ago. Forest products and stone are higher than a year ago. The latter has risen continuously since December.

	South					West				
Industrial Groups	March, 1933	Feb., 1933	Jan. 1933	Dec., 1932	March, 1932	March, 1933	Feb., 1933	Jan., 1933	Dec., 1932	March, 1932
All Industry	**85.9**	**99.3***	**90.1**	**94.1**	**92.3***	**95.8**	**102.0***	**100.0**	**93.8**	**97.0**
Chemicals	125.8	135.2	132.7	142.6	127.4	71.9	79.8*	78.2	76.8	81.1
Food products	128.1	131.5	128.0	124.3	116.0*	108.3	118.2*	116.2	113.2	116.8
Iron and steel	59.0	82.7	81.7	57.6	83.7*	.....	.....	.....	.....	.....
Metal working	63.6	85.7	59.3	54.5	60.6	.....	.....	.....	.....	.....
Metals group	61.2	84.0	71.8	56.3	72.6	45.4	44.8*	44.6	37.5	42.1
Forest products	28.4	37.6	36.6	38.7	48.4	136.7	144.8*	145.7	130.3	130.0
Paper and pulp	133.5	158.0	137.7	138.4	148.0	111.0	127.0*	138.4	125.5	144.0*
Rubber products	71.2	109.3	57.3	30.6	78.3*	27.9	46.8	76.2	50.2	102.5
Shipbuilding	.....	.....	.....	.....	.....	96.3	122.3*	107.3	112.4	86.4
Stone, clay and glass	107.0	103.8*	73.0	117.3	126.1	109.3	83.7	78.0	64.5	78.0
Textiles	95.3	119.3	101.5	108.8	96.2	.....	.....	.....	.....	.....

*Revision.



Electrical Works Less Active



Parallel with the decrease in activity in other branches of manufacturing, indicated by reports of energy consumption, and subject to similar qualifications as to the interpretation of the data, operations in electrical manufacturing establishments slackened materially in March compared with February.

According to this yardstick the industry is operating 27 per cent below its rate a year ago and more than 50 per cent below the rate three years ago. In January the decrease from 1932 was 38 per cent, in February 32 per cent. Individual returns show no unity of movement. While the average decreased a number of concerns stepped up their energy use and, by inference, their production.

Monthly Index of Electrical Manufacturing Activity

Adjusted to 26 working days
Base: Average Month, 1923-1925

Month	1930	1931	1932	1933
January	156.2	146.6	120.0	74.0
February	165.2	154.3	122.2	83.3
March	153.0	126.1	102.9	75.0
April	164.9	138.1	95.6	....
May	158.0	136.7	92.8	....
June	160.2	135.2	83.1	....
July	148.5	133.4	79.2	....
August	152.2	126.9	67.6	....
September	150.0	132.6	81.4	....
October	140.6	130.4	80.9	....
November	137.5	126.9	85.6	....
December	132.4	123.5	76.0	....

Retailing for Profits

By L. W. W. MORROW
Editor ELECTRICAL WORLD

Contractor-dealers can make money.
Reorganization of distribution necessary.
Manufacturers should exchange glory for good will.
Typical interviews.
Conclusions.

"ARE you going to bid on the motors and other electrical equipment for the new factory addition of the X Manufacturing Company, here in town?" This was my question to an intelligent and representative contractor-dealer. "I probably will," he replied. "But I have no chance to get the order. Salesmen of manufacturers and jobbers are swarming on that job and quoting figures I couldn't touch. I shall only be wasting my time."

"But this company is your regular customer," I said. "You should have a look-in on a respectable order like this."

"Sure, in theory I should get the order, but that isn't the way business is now done. I serve this customer for small purchases, engineer his electrical applications and build up his acceptance of the manufacturers' products, and then, when a good-sized order comes along, I can't compete with direct selling by manufacturers and jobbers. After this big order is placed, however, there may be some added motors and control, a wrong application or other things that will result in giving me some leftover business. No wonder I can't make any money. I cultivate a customer on a very small profit margin for years and then the direct sellers step in and take the business that appears in any volume. I don't blame the customer, but I do think the manufacturers and jobbers make a mistake in their invasion of my legitimate field of sales activity. So long as they persist in these practices the contractor-dealer cannot make money and cannot put money into business promotion. In this present market an order of any magnitude attracts presidents, sales managers and salesmen of manufacturers and jobbers like a gob of honey. They cut each other's throats and will do anything to get the order. I cannot compete in this kind of scramble because their direct prices are so low that half these large orders placed are taken at a no-profit price. If I were left to handle this business I could sell it at a fair profit. I could sell it most inexpensively and I could sell it most intelligently, because I know the customer's conditions very intimately."

Manufacturer builds down

"What is the remedy for this situation?" was the inevitable question I asked next. "To be very frank," the contractor-dealer replied, "the manufacturer has tried to build his business from himself down instead of from the public up. After the manufacturer has decided how he wishes to run his business then the wholesaler decides what slice he will take, and the final step only is left to the contractor-dealer, who is helpless to get his point of view accepted or his position admitted. What would we do today in business if we were openminded, observed facts and were willing to discard the accumulation of competitive practices, entrenched sales managers, scenic vice-presidents and departmental theories and hobbies?"

"Now you are getting to the point," I interjected. "This is what we would like to know."

"First of all," he replied, "as an industry we should decide what the public and consumers need and could profitably buy. Then we should find how many consumers there are, where they are located and their characteristics. I think these data would show instantly that they are so numerous and so thinly scattered over a large territory that any manufacturer and even any jobber would admit the foolishness of their attempting to sell them all directly. Despite the 'Fuller Brush Man,' manufacturers in general should have learned that the public can be most economically reached, most efficiently served and best satisfied if there are an adequate number of prosperous retail outlets. These are in daily touch with customers and render a personal as well as a business service which no distant corporation can provide through intermittent contacts. The retailer is the 'customer's man,' who gives the consumer those elements, tangible and intangible, which develop business and inculcate that kind of good will and integrity that is just as important in sales as the quality and integrity the manufacturer builds into his product.

"Is it not evident that the manufacturer can only have as his share of good will that part the retailer creates for him? And will not the good will of the dealer toward the manufacturer be in direct proportion to the way he is treated by the manufacturer? More than one army officer has been shot in the back by his own men in the heat of battle because of the cumulative effects of months of arrogance and despotism."

"You speak very positively," I could not help exclaiming. "Is the situation as serious as your words indicate?" "It is so serious that I have no fear of exaggeration. I hope you have the courage to print what I say, for this industry can do business and make profits only if it faces facts and reorganizes to do business intelligently."

"Look back about fifteen years to the time when a jobber was a human individual," he continued. "He lived in a town with contractor-dealers as his retailers and had built his business on his personality and business ability, backed by the integrity of products of the manufacturers he represented. The contractor-dealers were the friends of the jobber as well as his customers and the jobber looked to them almost entirely to sell his

goods to their friends who were the ultimate consumers. Today these relationships are largely gone. The chain jobber particularly is a cog, and an unimportant cog, in the mechanism of distribution set up by the manufacturers and driven by distant forces at manufacturing headquarters. He is largely owned or controlled and has been cowed by the direct selling competition of the manufacturer to the degree that he no longer has authority or initiative. He has lost his contractor-dealers as friendly outlets. He is an inanimate cog in a mechanism devised by the manufacturer to move goods.

"The local contractor-dealers saw their old friend the jobber put out of business or petrified and replaced by a mechanical thing that had no interest in the good will of the contractor-dealers. The manufacturer felt that the great name of his company was more important than any local good will. He felt that he alone knew how to sell or could sell profitably. He took pride in driving his intricately geared and inanimate distribution mechanism, whose only measure of accomplishment was the meeting of sales quotas. How sales were made or who made them did not count at headquarters. The jobber was to get the business, to get it away from competitors, from the contractor-dealers, from every one but the district salesmen of his manufacturers. All this was without consideration of the economics of selling.

Breakdown of good will occurred

"Does the industry realize how this has broken down faith, confidence and good will on the part of both jobbers and contractor-dealers? Remember that this good will was the result of years of previous effort and its tangible value made the name of the manufacturer. But this was not the end. The contractor-dealers were left in the cold, to survive or perish, for some years. Recently, however, some manufacturers thought about them and have tried to make them cogs in their distribution mechanism.

"Here is an example of the experience of a friend of mine in another city," he continued. "This man was doing a good business, had many friends and bore a splendid reputation. A large manufacturer went to him three years ago and suggested that he accept the franchise as an exclusive retailer of the manufacturer's products in his town in return for the numerous sales aids and good advice the manufacturer would render. The proposition looked good and my friend accepted. But what happened?

"The experts of the manufacturer told him how to run his store, add to his staff, make sales and reorganize his business on a very ambitious scale. They fixed a monthly budget for his operations and told him what to do to be a great success. Then the plan went into action. Every month after that my friend lost from $400 to $1,000, although he and the staff worked to the utmost to do business according to the plan. In eighteen months he had sunk $10,000 of his money, and even then he accepted this as a pioneering investment that would be returned in the future. But suddenly he was told by the manufacturer that he had changed his policy to get more sales and that several other dealers therefore had been authorized to compete with him in his city and to capitalize upon his pioneering investment. The result was that my friend was squeezed dry of his capital. He was then thrown overboard and the new dealers were drawn into the manufacturer's pool."

"You quote a bad case," I said. "Surely these instances are uncommon."

"Not at all," he replied. "Contractor-dealers can quote you many such cases. Take two other instances that come to mind. One concerns a contractor-dealer who pioneered and built up a good business as a specialty dealer on a specialty product. Then the manufacturer learned of the volume. First he wished to put a competitive distributor in the area. When this idea was licked he turned around and cut the dealer's margins in half, placing this product in the category of other profitless products. Can you imagine the effect of this on this dealer's enthusiasm, sales initiative and loyalty to the manufacturer?

"The other case comes from another friend in another city. An industrial customer of the contractor-dealer was in the market for some electrical products. A large manufacturer whose products were handled by this contractor-dealer quoted the customer directly through the district office. Both the jobbers and contractor-dealer were by-passed by direct selling. The customer was quoted an installed price of $11,700, the contractor-dealer was quoted a price of $11,500 by the manufacturer-jobber chain for the same products without installation. Add some 800 hours of labor and the bond and job expense of the contractor-dealer and his minimum installed cost, without overhead, was $12,750, as contrasted to the $11,700 quoted directly by the manufacturer. This difference in price got the business, but at what a price in loss of good will. I also question the economics of the sale even from the manufacturer's cost accounting. I venture to say this order was taken without any consideration of cost and returns.

"Here is another instance: A small mill was about to install a motor. Its regular contractor quoted on the installation of a motor of one manufacture. When the manufacturer learned that the motor was to be bought a representative went to the mill owner without contacting the contractor. In the fear that some other manufacturer would get in on the job, the favored manufacturer quoted a price below the contractor. The job was finally let, the contractor getting the labor and the manufacturer the motor. The humor of the situation, however, is that the motor that was installed was the same motor that the contractor was quoting on. The contractor lost the profit on the motor and he also lost all of his confidence in the manufacturer. The manufacturer paid a traveling expense to that town and back and took a price less than he would have got from the contractor. Isn't that wasteful selling on the part of the manufacturer?"

Can sell engineering products

"But it is claimed that the contractor-dealers cannot sell motors and control as intelligently as the manufacturer," I said. "Is this not engineering selling?"

"I grant this is true in some instances where special engineering is required," he answered. "But with the ordinary type of small factory using standard motors and controls many contractor-dealers can sell this equipment more intelligently and more inexpensively than the usual type of manufacturer's salesman.

"But let me cite a case of unintelligent selling by the manufacturer," he continued. "This is about a Southern cotton mill. A typical Southern cotton mill engineer laid out plans, and they were very good. He made

up equipment specifications and sent them out to the manufacturer, as to size of motors and so forth. There are usually anywhere from 500 to 1,500 motors in an average cotton mill, sometimes more.

"In this case the contractor was successful in securing the electrical installation. All the equipment had been bought from the manufacturers. It was listed in the specifications as 'Contractor to install such-and-such motor and such-and-such starter.' This installation was made, and on 50 spinning frames that were installed side by side for the 5-hp. motor on the end of each one of them, individual drive, the manufacturer in order to secure that business had cut down the size of the magnetic switches controlling those motors to such a point that they were just on the point of being overloaded. The salesman knew very little about those spinning frames. They were operated at a speed that he hadn't counted on, which automatically increases the load, just as a centrifugal fan speeded up would increase the load. The minute those motors were put in operation the magnetic switches began to burn out, with the safety switch ahead of them. In most cases both of them burned out. The manufacturer came back and said: 'These switches are not installed properly.'

"The contractor convinced him and the engineer that they were installed properly and the manufacturer proceeded to look for another alibi, which was never found. They did go back and say, 'We will replace the magnetic switches.' They gave larger switches. They sent 50 switches. The contractor was to take the old ones off and put the new ones on. That was the electrical contractor's contribution to the manufacturer's sales ability. The contractor refused to put them on, of course, without pay. He gave the owner an estimate for the cost of installing them before he ever started, and the owner immediately took it up with the manufacturer. The manufacturer went back to the contractor and raised Cain about him wanting to charge the owner for installing these switches. He said: 'We have agreed to replace the switches.'

"The contractor asked him, 'Who is going to pay for the installation?'

"The manufacturer said: 'We are not interested in that. I think we have done our part if we replace equipment that is defective.'

Manufacturers' salesmen inexperienced

"That is the thing you are up against when you have manufacturers selling direct, with the type of salesmen the majority of them have. A lot of the salesmen are boys who come out of college with what they think is a good education. They learn as they go on, but often they get jobs like this which they are just not capable of handling. The electrical contractor could have gone into that with the engineer and that equipment could have been served properly.

"I don't know whether we can convince the manufacturer that it is better to handle equipment of that kind through capable contractors who are familiar with that kind of work or not. It is rather problematical, because they are going out after big orders. The equipment amounts to about the same as the wiring job in a cotton mill. They are going out to fight for the jobs by putting in the skimpiest kind of material, the smallest motor they can get by the engineer, and the contractor has to bear the brunt of it."

"I think our large manufacturing corporations fail to have a conscience and to think straight," this contractor said to me. "No national advertising in magazines and on the radio can replace the effect these practices have on the loss of faith and loyalty of thousands of retail outlets who daily meet and talk with customers of the industry."

"But you believe in some direct selling by manufacturers, do you not?" I asked after the temperature had cooled slightly.

Believes in selective marketing

"Of course I do," he replied. "There is nothing in what I have said to lead to any other conclusion. I believe certain large accounts should be sold by the manufacturer directly. I believe the jobber in a local area should sell certain large and specialized accounts in addition to his sales to retail outlets. But these allocations should be made intelligently and on a cost accounting basis. At present the manufacturer is a wild hog in the marketplace. He will not grant the jobber and the dealer the right to handle their legitimate customers, especially when an ear of corn of respectable size drops into the feed trough. I believe in selective marketing and multiple selling wherein each agency should find its legitimate field and stay in it on the basis of costs and economic selling. But I also believe there is more to business than dollars, and the greatest failure in marketing today is a lack of recognition of the value of human relationship only obtainable by the use of retail outlets."

"But what about the direct selling of the wholesaler?" I asked.

"On the whole, this is a worse situation than the direct selling of the manufacturer," he replied. "I have no objection whatsoever to any direct selling activity that is economical. I am unalterably opposed to any thought that the wholesalers should stop direct selling out of loyalty to contractor customers. I prefer to view the whole question in the cold light of profit. If we could get the wholesalers to classify their wholesale accounts so that they would serve only profitable accounts we would make considerable progress. Thousands of factories have electrical departments today that aren't worth a damn. The electricians, besides being poor workmen, are very expensive. The jobbers, however, were the ones who sold this idea to the factories so that the factories could buy wholesale discounts. I believe small factories should use contractor-dealers for maintenance work and that this practice would be better and cheaper than their use of half-competent electricians."

"How about the selling of the local utility?" I asked. "Should it get out of merchandising?"

"No, indeed," he replied, "not if it plays fair. The utility is needed to help develop the market and sell the public. But it should buy and sell as we do and should co-operate with us. We ask no special privileges and would like to work with other retail outlets. But I believe we should get the same terms on purchases for retail as the utility.

"We object to utilities obtaining confidential discounts on motors, for example, and using this advantage to sell industrial consumers at prices we cannot meet. I know of several instances where the manufacturer made use of a confidential and special discount to a utility, sup-

posed only to be for apparatus used by the utility in its own business, and by that means by-passed the contractors to sell directly to an industrial customer. This practice enabled the manufacturer to undersell the other motor manufacturers. As retailers we ask no subsidies or favors, but we do believe we have a legitimate place in distribution and we ask that the manufacturer, wholesaler and utility recognize this fact and admit the economic and service advantages of our activities."

"We ask for an opportunity to co-operate in sales and market development with the other agencies. We think of ourselves as the liaison between the manufacturers and utilities with the public and our function is to win the confidence of the public and to sell it electrical service. Today we are left chiefly to provide the labor to connect the devices sold by the manufacturer, utility or jobber. Our customers can even buy as cheaply as we can. We are not pleading for subsidies or special dispensations. We claim that we have a legitimate economic function in distribution and that this can be proved. We claim that the other agencies fail to realize this fact and act upon it from their own selfish viewpoint.

"We want to make money for ourselves and for the manufacturers. We can do this if we are given a fair show, based upon facts only. We claim that the personal and human relations we develop with customers is the greatest sales promotion asset of the industry. We ask only that selective marketing principles be applied to distribution. We ask for co-ordination and co-operation. We have asked this for years, but now it is a race to see whether we, the manufacturers or the jobbers go broke first because of the maintenance of an obsolete distribution mechanism."

Conclusions

The comments of contractor-dealers in this article are quotations from individual men in many localities and represent a typical cross-section of thought and practice in this field. These men are not whining or complaining. They endeavor to state their case in order to be constructive and in order to show that they can be a part of distribution that will operate most economically and most effectively in selling certain classes of accounts. They claim a hearing and plead for use of facts and costs.

To an observer many of the claims of the contractor-dealer are sound and logical. He is a local agency and it is unsafe to generalize on a national basis, but, being local and in direct contact with customers, his opinion is competent. The problem, however, is to introduce national policies that will permit local contractors, wholesalers and manufacturers' salesmen to classify local accounts and make out a plan for local selling and local market development. This local problem quickly reduces to a problem in cost accounting. Each agency must and should sell in a local area, and to define accounts in terms of economic coverage is difficult because each agency is apt to think that it can and should sell many identical accounts. Any workable plan must be developed slowly in each local community, but this can and will be done if national policies and classifications are stated broadly enough to give local freedom of action and guidance in local plan development.

The chief point to this article is that an intimate observation of the field shows that the contractor-dealer has a legitimate and necessary place to cover two functions:

1. To sell those classes of accounts that he can sell more profitably than any other agency.
2. To install, maintain and even supervise many small electrical installations in industry where the magnitude of the operations do not warrant the employment of a full-time and competent electrical engineer.

In this period of readjustment it seems logical, in the light of the facts and opinions stated, for the contractor dealer to get together with the wholesalers and manufacturers both on a national and a local basis. National meetings should develop a broad classification of accounts, a cost accounting system for determining sales costs and returns, a policy as to organization and sales practices and a policy to permit local groups to institute and work out local co-operative plans on a selective marketing basis. All this must be within the law.

In each local area there should be parallel work to find costs and facts and then to institute a local selective marketing plan based upon this classification of accounts, sales cost accounting and co-operative market development. The place of the contractor-dealer in distribution is a matter of fact, and not opinion. The facts are readily developed in a local community, and local action should then be had.

▼

Synchronous Motor Excitation Controlled by New Relays

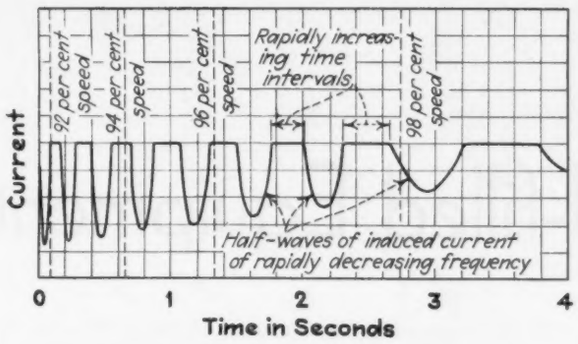
By N. L. HADLEY

Industrial Engineering Department, General Electric Company, Schenectady, N. Y.

MODERN synchronous motors are all designed to perform creditably as induction motors while coming up to speed. Direct current must be applied to the field windings for synchronous operation and a timely application of excitation will give a comparatively smooth transition from induction to synchronous operation. If the motor is pulled out of step for any reason excitation should be removed immediately, allowing the motor to revert to normal induction-motor action, so that resynchronizing may take place if the equipment has been designed for this service. If excitation is applied at too low a speed, or is not removed promptly upon pull-out, severe line disturbances will result and production or operation may be unnecessarily interrupted by the stalling of the motor.

It is evident that precise and reliable control of these functions is fundamental to a full realization of the best performance of synchronous motors. New methods for automatically applying and removing field excitation are now being used to meet the exacting requirements of the wide variety of applications of synchronous motors.

For each synchronous motor installation there is a definite minimum speed which must be attained to insure synchronizing upon applying excitation. This speed lies in the narrow range of 95 to 98 per cent of synchronous speed for practically all applications. It at first appears to be a most difficult problem to obtain a high degree of



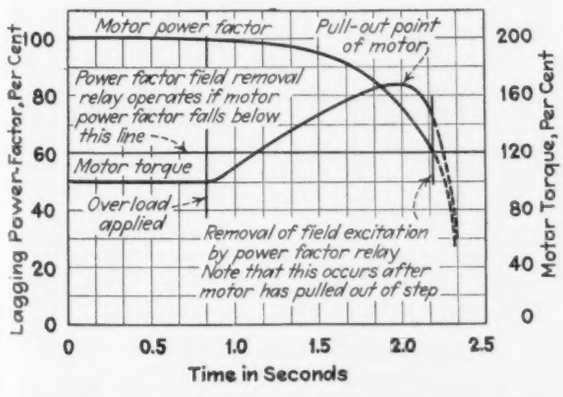
Slip-frequency relay puts excitation on

Assume a time-delay setting which corresponds to 96 per cent speed. The relay picks up as soon as the motor is started and at all speeds below 96 per cent the time delay prevents drop-out between successive half waves of slip-frequency current. During acceleration the slip frequency decreases, and when a speed just above 96 per cent is reached the time interval between successive half waves is greater than the time-delay setting and the resulting drop-out of the relay provides the impulse for immediate automatic application of field.

accuracy in an attempt to apply field at any desired speed within so narrow a range. If we use as an indication of motor speed the time interval of a half wave of induced field current at slip frequency a high degree of accuracy is automatically obtained. Near synchronous speed the length of such a time interval changes rapidly with a small change in speed because it is inversely proportional to motor slip, which becomes very small as synchronous speed is approached. For example, the time interval of a half wave of slip-frequency current at 98 per cent of synchronous speed is two and one-half times as long as the corresponding interval at 95 per cent speed.

This principle is utilized in a new device known as the slip-frequency field application relay. The relay coil is connected across a section of the field-discharge resistor in series with a copper-oxide half-wave rectifier which permits current to flow in one direction only. The coil is thus alternately energized and de-energized at slip frequency. A copper jacket around the relay core provides a time-delay drop-out on the prolonged field decay principle. This time delay can be adjusted between limits corresponding to 92 and 99 per cent speed, a ratio of 1 to 8 in the time-delay settings.

The automatic removal of excitation when a motor is pulled out of step is just as important a function as automatic application of field excitation. The fundamental requirements of a device for removing field are that it shall be reliable and must operate immediately upon pull-out without, however, removing field before pull-out has definitely occurred.



Power-factor relay removes excitation after pull-out

Motor power factor appears to be one of the most reliable indications of operation out of synchronism and it is one which can readily be used in a device for promptly removing excitation. A synchronous motor normally operates at unity or a leading power factor. Even at the maximum load which the motor can carry in synchronism the power factor will not drop below 70 per cent lagging. If the motor pulls out of step, however, the power factor passes through a very low lagging value each time a pole is slipped. A new device known as the power-factor field removal relay meets all of the requirements for a reliable, prompt-acting device for removing excitation when a synchronous motor is pulled out of step. It is an induction-type relay with its current and potential coils so connected that it operates at a critical value of power factor of 60 per cent lagging, a value well below any at which synchronous operation is possible, but still far above the minimum power factor which must be passed through upon slipping the first and all subsequent poles out of synchronism. The relay contacts are placed in the coil circuit of the field contactor, and at any power factor above 60 per cent the torque of the relay holds these contacts closed, while at all power factors below 60 per cent lagging a positive torque acts to open them. The relay, of course, operates on the low lagging power factor of the motor current during the starting period, but this does not interfere with field application because the contacts are short circuited by an auxiliary relay until a definite time after field has been applied.

Utility Advertising

A utility company has no right to resent honest criticism, although it has a common right openly and frankly to present its side of the case. It has no justification for extending or withholding advertising patronage because of any editorial or news policy, directly affecting itself, on the part of any reputable newspaper. If there are good business reasons why the utility should advertise, these, not the policies of the medium, should govern its decisions.

If there is anything wrong—morally, commercially or legally—about utility advertising today, it is merely its inadequacy. There is not enough of it being done. Advertising in its various forms can be employed to a much greater extent than is the case at present. If this were so the pace of development would be accelerated, the maximum benefits of the services brought to many additional people in quicker time and the volume of output built up, so that the price per unit of service could be more rapidly reduced.

By W. H. HODGE,

Vice-President Byllesby Engineering & Management Corporation, before Pittsburgh Advertising Club.

Piping Systems for Oil-filled Equipment*

By WALTER B. MORTON† and BASIL PAYNE‡

THE large amount of oil contained in the oil-filled equipment in larger substations requires for convenient handling some form of piping system. This is especially true of outdoor substations where portable purifying equipment is at best awkward, and decidedly so under inclement weather conditions or at night. The use of an oil-piping system allows the purifying equipment to be located advantageously and permits the oil to be handled readily under all conditions.

The general character of an oil-piping system depends very largely upon the method of purifying employed. Two methods are in use, the "dumping" and "continuous." With the former method the oil from any particular item of equipment is all removed to a "dirty" receiving or storage tank, being replaced with "clean" oil from another storage tank. A piping system to serve under these conditions requires but a single pipe line (Fig. 1) to each piece of equipment, since oil flows in but one direction at a time. On the other hand, the pump and piping system must be of relatively large capacity if the exchange of oil is to be effected within a reasonably short time. This is because the flow of oil is slow under adverse conditions, these determining the size of the system.

When using the continuous method of purification oil is circulated from the equipment, through the purifier and back to the equipment without a material change of oil level in the latter. It is therefore possible to purify oil without removing the equipment from service. For this purpose two pipes (Fig. 2) are required to each item of equipment—an inlet and an outlet line. These lines may be smaller in size than those in the previous case, since the oil flow is limited by the capacity of the purifier and a rapid flow is unnecessary.

The choice between the two systems depends somewhat upon local operating conditions. A spare transformer, together with circuit breaker bypass and isolating switches, enables a crippled transformer or circuit breaker unit to be isolated from service with a minimum delay, after which it may be inspected, adjusted or repaired without a prolonged service interruption. Once isolated, either type of system is feasible, the single, large size pipe line allowing a more rapid emptying of oil. Where spare or by-pass facilities are not employed and the removal of equipment from service entails an interruption the continuous system has the distinct advantage, just mentioned, of operating without the removal of equipment from service.

Oil pipe lines are usually placed below grade, but in some cases are supported a short distance above grade, due to apprehension of water entering buried pipes. The difficulties encountered in making joints oil-tight have been largely overcome by the use of materials like litharge and glycerine paste, or bakelite varnish. The use of welded joint construction, which gives adequate assurance of oil tightness, practically eliminates the danger in buried lines and makes unnecessary above-grade installation which is inconvenient and unsightly as well as hazardous to personnel. Some engineers prefer to maintain a slight head of oil on all underground piping in order that any leakage will tend to lose oil rather than admit water.

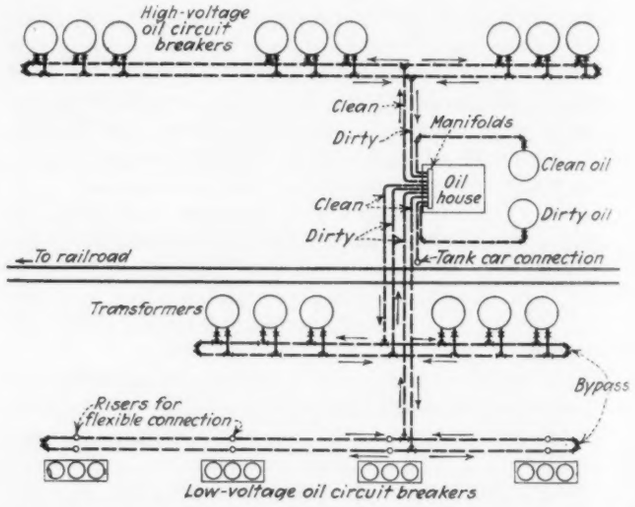


Fig. 1—Single pipe line used for both clean and dirty oil
Connections to equipment are made with flexible hose

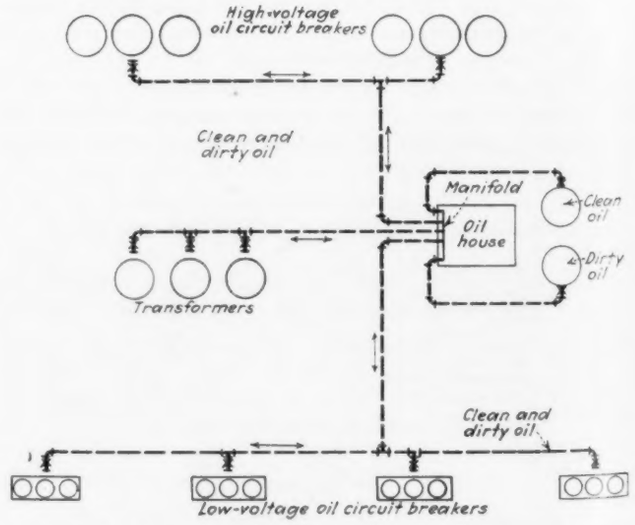


Fig. 2—Separate pipe lines for dirty and clean oil afford more flexible system
Permanent connections are made to high-voltage equipment and flexible connections to low-voltage equipment

*Book rights reserved. †Project engineer Philadelphia Electric Company. ‡Fairfield, Me.

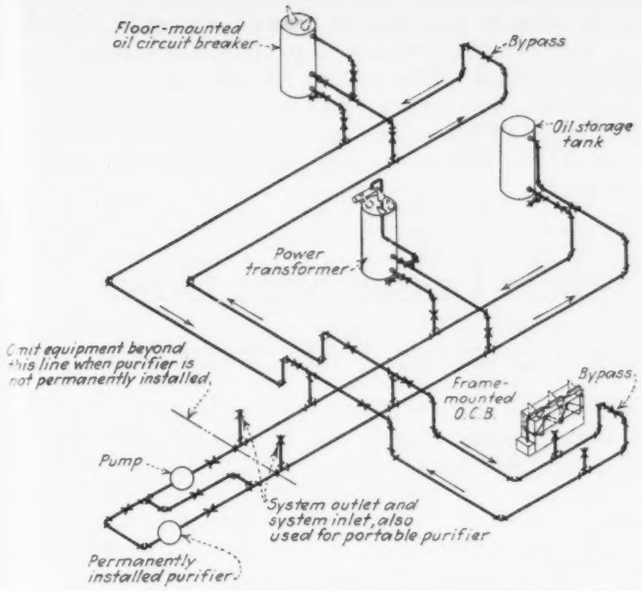


Fig. 3—Elementary oil-piping layout for outdoor installation

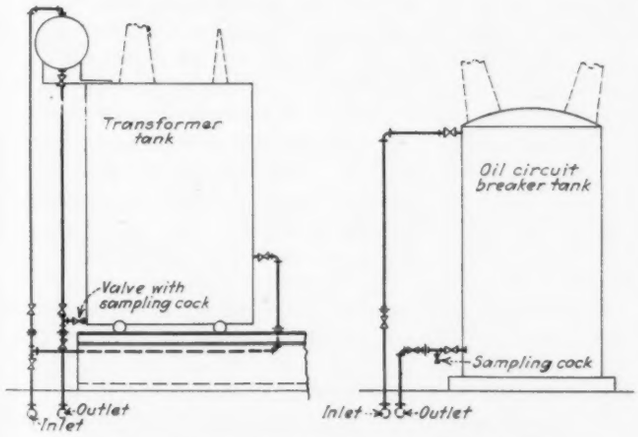


Fig. 4—Methods of connecting oil piping to equipment

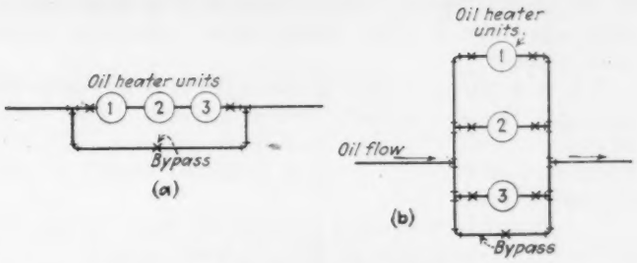


Fig. 5—Series connection of oil heaters preferred to parallel arrangement

Oil storage tanks must be of a capacity at least equal to that of the largest item of equipment. Where railway facilities permit, shipment of oil by tank car is desirable and tanks of 8,000 to 10,000 gal. capacity are required. A tank car connection is necessary where this method of shipping is employed. Single clean and dirty oil tanks may be sufficient where one type of oil is used in both transformers and circuit breakers. Where different oils are used separate tanks for each oil, four in all, may be required. Oil tanks are customarily cylindrical in shape and they are mounted in a vertical or horizontal position as desired.

Several oil system auxiliary details deserve mention. The use of a by-pass across the ends of long runs (Figs. 2 and 3) enables the oil contained within the system to be circulated and brought up to standard. This avoids the possibility of impure oil being introduced into any equipment in service. The by-pass valve and fittings should ordinarily be of the same size as the main system.

Connections to equipment may be made in either of two ways, by flexible tubing or by rigid pipe and fittings. Flexible tubing is convenient for frame-mounted breakers and smaller transformers and is preferred by some for all connections. However, for larger equipment, rigid connections (Fig. 4) are more convenient and, with the arrangement of valves shown, offer no particular hazard. Valves are placed on each side of a union in such a way that the union may be broken and the equipment moved without emptying the equipment or opening the oil lines. The use of two valves in series practically eliminates the danger of oil leakage from the equipment. Circuit breakers usually have but two connections, while transformers have more. The transformer connections in Fig. 4 permit the filtering of the conservator oil above, the lower oil in the base, or the entire transformer, as desired. Sampling cocks should be installed when not provided

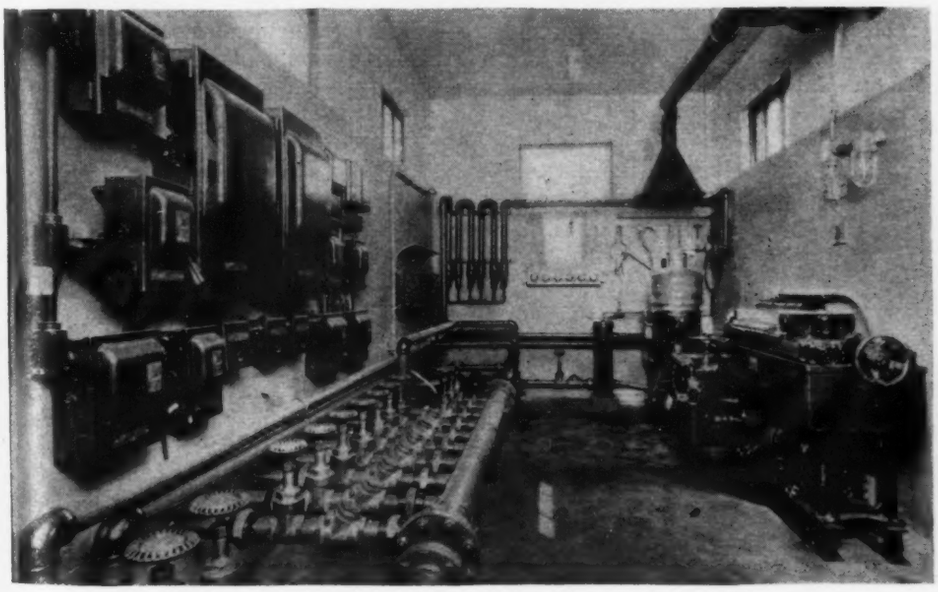


Fig. 6—Oil room containing purifying equipment and oil-control manifold

Filter press and centrifuge are on right. The drying ovens, in the extreme foreground, do not show.

by the manufacturer of the equipment, ½-in. globe valves with square-head plugs being more serviceable than smaller cocks.

Where a piping system is extensive it is advisable to segregate the system into several sections. This may be done at a manifold in the oil-house or room (Fig. 6) when such is provided or in a manifold located in the substation yard.

A point often overlooked in piping oil heaters is shown in Fig. 5. These should be connected in series (a), rather than in parallel (b). The loss of head will be slightly greater with the series connection, but the flow through parallel-connected heaters cannot be accurately controlled and burn-outs frequently result.

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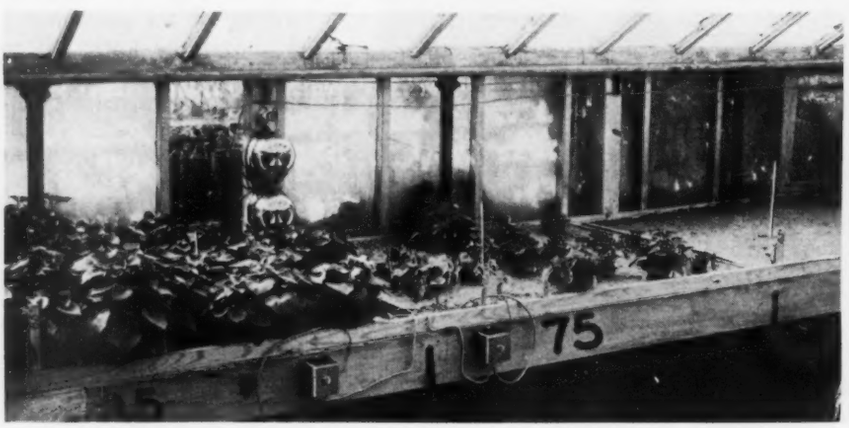
Electric Hotbeds Speed Sprouting and Maturing

That a uniform temperature of at least 85 deg. is essential for starting sweet potato plants and that a hotbed heated by electricity is practical are indicated by preliminary results of experiments being carried on at the Oklahoma Agricultural and Mechanical College, Stillwater. The results secured with three different soil temperatures in starting sweet potato plants are compared in the accompanying illustration, taken 29 days after bedding. The area of each bed was 13 sq.ft.

In this test plants came through the ground ten days after the potatoes were bedded in the 85 deg. bed, seventeen days after bedding in the 75 deg. bed and 36 days after bedding in the 65 deg. bed. The first pulling, consisting of 898 plants, was made in the high-temperature bed 29 days after bedding, and successive pullings of 658 and 357 plants were made in 37 and 47 days, respectively. The first pulling of 588 plants was made in the 75 deg. bed 37 days after bedding the potatoes. A second pulling of 278 plants was made in 47 days. The plants in the 65 deg. bed were not yet ready for pulling 54 days after bedding. Potatoes in a fourth bed, the temperature of which was held at 58 deg., had not sprouted in 54 days. The plants in the 85 deg. bed were uniform in size and all of the potatoes sprouted, while those in the other beds were not so uniform in size and some of the potatoes rotted.

These test beds were located in a greenhouse held at about 65 deg. temperature. Extra heat was supplied by electric hotbed cable controlled by thermostats. While final figures on comparative costs of sources of heat have not been compiled, reports from other states indicate that electricity as a source of heat for hotbeds is comparable in cost to other sources. This is a part of the work being carried on by the college in co-operation with the Oklahoma Committee on the Relation of Electricity to Agriculture.



Comparative results of soil heating

Twenty-nine days after bedding the plants were ready to pull in the 85 deg. bed; those in the 75 deg. bed were making slow growth, and those in the 65 deg. bed had not yet started.

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System Losses Kept Down by Constant Attention

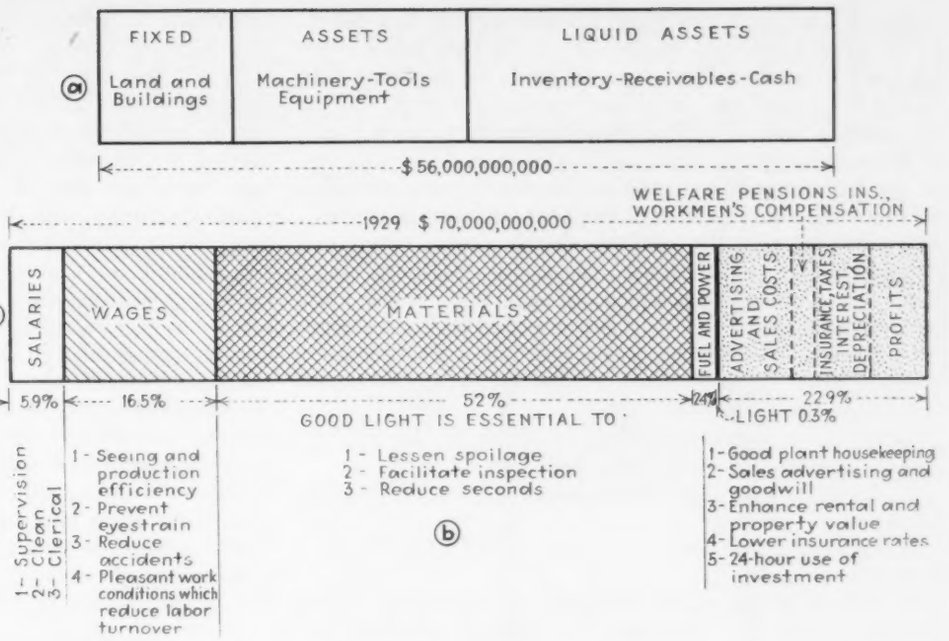
It is easy for the operating organization of a large system to become habituated to routines and practices that may be questioned and investigated with profit in terms of energy saved during times such as these. Several instances of this nature have been turned up in the work now in progress to reduce losses on the system of the Public Service Company of Northern Illinois.

In one case there were two substations connected by three parallel 12-kv. cables. At one of these substations each circuit was connected to a separate transformer for stepping up to 33 kv. It was found upon investigation that more efficient operation could be obtained during times of light load by cutting out one of these units and operating on the remaining two. During these light-load periods it was felt that two-line service was adequate.

Then a 750,000-circ.mil circuit was taken out of service. Soon after it was found that part of this circuit could be used to carry another load which was normally handled on a 300,000-circ.mil circuit. This was done and a line loss saving of 60 per cent was effected until the larger circuit was ready for normal use.

Unbalanced loading is a contributing factor to excess loss. This condition is usually detected either from poor voltage regulation or under- or over-loaded equipment. The operation of synchronous condensers has been given considerable attention. In many cases use beyond that required for sufficient voltage correction results in a greater machine loss than line loss saving. During light-load periods it has been found advantageous in some cases to shut down rotary converters at alternate substations supplying railway load. The saving resulting from shutting down a 1,500-kw. rotary which would otherwise be very lightly loaded is obvious.

A survey was made of energy used by the company for lighting and miscellaneous power to determine any apparent wastage. This matter might appear inconsequential, but when consideration is given the fact that several million kilowatt-hours are used annually by the company for lighting and miscellaneous power a slight reduction at each of the many locations will effect a considerable saving. This saving can be accomplished only by continual diligence on the part of all employees concerned.



Light is a small fraction of cost of manufacture in industry

(a) Capital assets of manufacturing industry.
(b) Production accounts of manufacturing industry.

By WARD HARRISON and C. E. WEITZ*

Nela Park, Cleveland, Ohio

Light for Production

FROM estimates made by one of our large construction firms we find that the lighting system such as it would consider average today, and with building construction costs down to their present low levels, represents from 6 to 10 per cent of the cost of the building. In the accompanying illustration we find that of the total capital assets used in manufacturing industries the cost of the building itself is a small portion of the investment. From one to five times as much money must be invested in tools and equipment to get the plant ready for operation as was represented in the cost of land and buildings, and once the plant is in shape, at least an equivalent amount of liquid assets must be available, in the shape of inventory, receivables and cash, in order to do business as a going concern. Therefore, when we consider the cost of lighting in terms of the total capital investment in a business, the lighting system represents probably not more than 2 per cent. Furthermore, for a 30 per cent increase in the appropriation for a lighting system the capacity of the system may be doubled.

Distribution of the major accounting items of total production costs are shown in (*b*) in the accompanying illustration. It is made up of the following: Salaries, 5.9 per cent; labor, 16.5 per cent; raw materials, 52 per cent; fuel, light and power, 2.7 per cent; miscellaneous, 22.9 per cent. The latter figure, of course, covers such subdivisions as advertising and sales cost, insurance, taxes, employees' welfare and pension plans, workmen's compensation, depreciation and maintenance and, finally, the profits of the enterprise.

We have separated out from the light, fuel and power cost item the percentage represented by lighting alone, based on factory survey data, estimates from lamp consumption, and other sources, and *we find the cost of lighting represented by a very narrow segment of the chart, equivalent to about three-tenths of 1 per cent of the value of manufactured products.*

Now with this picture of investment and of production economics, and with lighting allocated to its relative position, our next step logically is to examine what we may expect to get from contemplated lighting expenditures and to find out how much and in what form any yield may come from our investment in this essential facility. Lighting spreads itself tangibly and intangibly over every phase of factory operation, and so we have set down under each subdivision of this chart a number of points on which lighting seems to have some effect. In the administration of the business, as represented by salaries, we have the several advantages:

1. Promotes ease of supervision.
2. Stimulates orderliness and better plant housekeeping.
3. Reduces clerical errors.

It is difficult to assign any actual figures to the savings resulting, but it is probably sufficient to contemplate the fact that it would only be necessary to save on salaries in the proportion of 5.9 to 5.6 per cent in the production scheme in order to pay for double the existing standard of lighting throughout the entire factory and office space. It is our belief that levels of factory and office lighting could well be doubled without exceeding present-day conservative standards.

The value of industrial lighting has usually been expressed in terms of its cost to the payroll, the statement being rather common that good lighting could be obtained at an additional cost of about 2 per cent of the payroll. This average percentage was determined from a good many actual cases where improved lighting had been

**Abstract of paper presented at the lighting conference, Case School of Applied Science.*

installed, and it checks reasonably well with this chart. If we take 2 per cent of the 16.5 cents that the worker gets out of each dollar of goods sold, we find that this equals between three- and four-tenths of a cent. Since our average cost of lighting in all industry today is equal to about three-tenths of a cent out of each dollar's worth of goods, obviously we could double the existing standard at about the equivalent of 2 per cent increase in payroll. It is obvious that the cost of electric power could not be expected to keep pace with the rapidly declining wage scale and material costs which we have just experienced, so that it is only fair to point out that at the present time lighting has become a somewhat larger proportion of the budget than it was in days of high prices and large volume of business.

If we try to appraise lighting in terms of factory employees, we can set down these benefits:

1. Better seeing and consequently higher production efficiency.

2. Less eyestrain and eye defects, and general conservation of vision.

3. Less accidents, with consequent less suffering of the worker and less actual money loss due to attendant or "hidden" costs.

4. Bright and cheerful working conditions, having favorable influence on labor turnover, which in normal times may be as high as 100 per cent per year.

Unfortunately, in most discussions of lighting economics by salesmen major emphasis has been placed on increased production efficiency per worker as the one single justification for better lighting. While this phase is one which can be reduced to tangible values which appeal to the factory executive, it is in fact, and should be considered, one of the minor items in the broader philosophy of the service of good lighting. Let me dwell at more length on the considerations of production efficiency, not that lighting should be justified on this basis particularly, but that it is the one factor on which executives feel they can justify all expenditures. A great many tests have been reported in the trade press during the past decade showing the increased production from better illumination. These tests record all the way from 10 to 25 per cent increased production due to better lighting. While we are firmly convinced that better lighting will not fail to increase production efficiency—we are somewhat skeptical about quoting test results because of the many factors which must be controlled and because of the many internal changes and conditions within the factory itself presenting new aspects during test periods—it is rather difficult to isolate the effect of illumination definitely.

However, one needs only to superimpose this segment representing lighting costs at one end of the labor division in order to see how small an increase in efficiency would be needed to justify doubling the illumination with all the many intangible elements of illumination thrown in as a coupon.

We should like to emphasize, before going further, that when we speak of good illumination or improved lighting we don't mean high levels exclusively, though industry in general is way underlighted; better quality, direction, contrasts and more skillfully planned installations are quite often more important than mere quantity of light.

We are very much impressed as we go around the industrial plants to see what a large proportion have a miscellany of lighting equipments and devices doing duty as a lighting system. We have come to the belief that fully 70 per cent of the plants in this country could improve their lighting to a remarkable degree by the simple expedient of a more orderly plan which would involve not necessarily increasing operating cost but, in fact, in a number of cases actually reducing it. In substantiation of this belief we have taken occasion to analyze the sale of industrial reflectors as reported to the Department of Commerce by the principal industrial reflector manufacturers. If we take the aggregate number of reflectors sold since the war we find that this does not much exceed 30 per cent of the estimated number of industrial sockets in the United States, leaving the conclusion that at least 70 per cent of the existing sockets are either without reflectors or are reflectored with haphazard devices installed and designed for lamps which have been made obsolete by the development of new illuminants and modern equipments since 1919. Such systems cannot help but be inefficient and uneconomical, let alone being far behind our present conception of the service of light in industry.

Night operation advocated

So far we have referred only to the two items, (1) salary and (2) labor, in the distribution of manufacturing expenses. The third item, that of materials, is by far the largest part of production cost. This is an item in which spoilage of materials, lessened "seconds" and higher quality of product are eminently related to the lighting. Even a small saving by the reduction of "seconds" and spoilage might quickly pay for the additional cost of the most ambitious standard of lighting.

Speaking of the 22.9 per cent of production cost represented by miscellaneous expense items, one would hardly expect to find the effect of lighting here; nevertheless, the value of lighting does manifest itself in several ways.

One bane of business today is high fixed capital charges—that is, interest and taxes on property that is producing much below its capacity. We hear a great deal of talk about this excess plant capacity now, but when business again becomes normal, factory executives will start thinking of new plants and the tendency will be to settle into the old order of things, that of spending $330,000,000 annually for new factory space (which they averaged for the ten years 1920 to 1929) and then filling this space with new machinery and equipment, both items of which mean added overhead in the form of interest, taxes, insurance and depreciation.

The alternative is to equip the existing plant for really efficient night operation, and we in the lighting business have the fullest confidence that we can aid materially in this because we know that as far as illumination is concerned night operation can be made as efficient as day operation, if not more so.

And, finally, when we consider the proportion about 6.5 per cent of total manufacturing cost as represented —(*b*) in the accompanying illustration—by fixed charges on plant investment, compared to either the small investment or operating expense of the most advanced lighting system which permits 24-hour full efficiency use of present investment, we cannot help but feel that lighting has a dominant position in industrial economics.

Do not misunderstand that we are advocating that obsolete and inefficient plants be kept in service, par-

ticularly if adequate reserves for replacement have been set up, when they ought to be scrapped to make room for newer and better ones. We are simply arguing against plant extensions planned on an eight-hour day basis, when it seems patent to most of us that the future of industry holds a six-hour day and five-day week. It is unthinkable for us to build new factories that will stand idle for 138 hours a week and run only thirty. Surely two- and three-shift, if not continuous, operation must become the rule of the future.

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1½ Years Without Flashover

This record obtained on 374 circuit-miles of 132-kv. line subjected to 110 lightning storms. Co-ordination of wood construction with insulators, guy wire and ground lead attachments coupled with low horizontal construction and two ground wires earthed at each structure constitute major features of 53 per cent of the route mileage.

By L. O. WAITE
Stone & Webster Engineering Corporation

TWO 132-kv. lines quite different in character comprise the Osage transmission system of the Union Electric Light & Power Company (Missouri). The 119.5-mile line from Osage power plant to Rivermines is a double-circuit line carried on steel towers with hinged wood crossarms. Its construction has been described before.* The 135.5-mile line from Osage power plant to the Page Avenue substation, in the outskirts of St. Louis, is a single-circuit wood frame line for most of the distance.

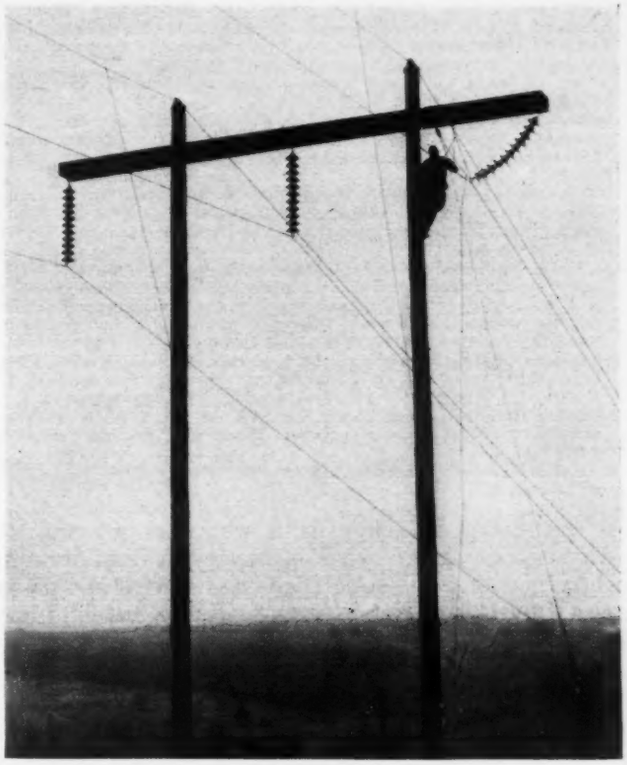
Both of the lines were placed in operation in midsummer of 1931 and went through the balance of the year and all of 1932 without a flashover. During this time the lightning seasons were by no means as severe as have been experienced in this district, but the following figures indicate that the lightning exposure has at least been normal. Each of the lines is divided into three sections for patrolling purposes, the sections varying from 35 to 50 miles in length. The total number of lightning storms reported by the three sections of the Rivermines line in the year and a half was 107 and by the three sections of the Page line 110. In these totals storms observed by patrol crews of adjoining sections appear twice. On the other hand, owing to the length of the sections, some storms must have been unrecorded.

A summary of the design data for the Page line is given in the accompanying table. A second Page line, duplicating the first, was built in 1932, but only one line is operated.

Three factors contributing to performance

Aside from the careful patrolling and maintenance which an operating record like this implies, the good performance of the Osage-Page line may be attributed to three factors in the electrical design:

1. The relatively low elevation of the conductor supports.



2. The high degree of conductor insulation obtained by the use of wood in the poles, arms and guy insulators.

3. The thoroughness of the ground protection, consisting of two overhead ground wires with earth connections at each structure.

Low elevation of conductors is of advantage in reducing the number of direct strokes of lightning to the line and also in reducing the potential of all lightning voltages on the line, both direct and induced. The wood frame line with its horizontal configuration of conductors lends itself very well to low-conductor elevation, the economic height of steel structures frequently being a deterrent to taking full advantage of this factor in design:

The insulation consists of strings of eleven suspension type porcelain insulators in series with 8 ft. 2 in. of wood crossarm and 2 ft. 9 in. of wood pole between the arm and the fitting for the overhead ground wire. This assembly would be equivalent to about twenty-two insulator units if the parallel air paths were of equal value, but the striking distance from the conductor through the air to the earthing wire has been adjusted so that flashover would be by this route rather than over the wood. This reduces the net insulation to the equivalent of twenty 10x5¾-in. insulators requiring a minimum surge of about 1,500 kv. crest to flashover. The possible ill effect of guys on the net insulation has been neutralized by careful location of the point of attachment to the pole and by the use of wood guy insulators. The balancing

*See "Electrical Engineering," February, 1932.

Data for Osage-Page Line

Length—On wood frames, 129 miles. On steel towers, 6.5 miles. Total, 135.5 miles.
Circuits—One 132 kv., three phase, 60 cycle.
Conductors—Three 336,400 circ.mil. A.C.S.R.; 26 strands of aluminum over 7 strands of steel.
Ground Wires—Two $\frac{7}{16}$ in., seven-strand, Siemens-Martin steel, galvanized.

Standard Frame Height:	50-ft. poles	55-ft. poles
To ground wires at tops of poles ..	43.0 ft.	47.5 ft.
To conductors	32.6 ft.	37.1 ft.

Standard Frame Wire Spacings—Horizontal between conductors, 16.3 ft.; horizontal between ground wires, 16.3 ft.; diagonal between conductors and ground wires, 19.6 ft.
Length of Span on Wood Frames—Average 525 ft. Normal on 50-ft. poles, 465 ft.
Poles—Southern pine, creosoted to 8 lb. retention per cu.ft., 9 in. diameter tops. Standard heights 50 and 55 ft. Special heights for clearing other utilities and for special frames, 60, 65 and 70 ft.
Crossarms—Douglas fir, creosoted to 6 lb. retention per cu.ft. Double arms 4 x 10 in. x 33 ft. 4 in. long, spaced 8¾ in. back to back. 6 x 10-in. arms used when equivalent span for vertical loading exceeds 800 ft.
Guys—$\frac{7}{16}$ in., seven-strand, high-strength steel, galvanized, with a 9-ft. wood insulator. Guy attached to pole 6 ft. below crossarm and anchored to galvanized steel channel anchor. Standard frames were guyed when the equivalent span for transverse loading exceeded 565 ft. or soil conditions required it.
Insulators—Socket type porcelain suspension insulators, 10 in. diameter, spaced 5¾ in. Strings of eleven in suspension and thirteen in strain. No arcing horns on initial installation.
Earthing Connections—$\frac{1}{4}$ in. Copperweld from each overhead ground wire, at each structure. Maximum ground resistance 60 ohms.
Wire Tensions—Conductors and ground wires strung to 1,400 lb. at 60 deg. F.

of the several discharge paths was worked out at the Westinghouse high-voltage laboratory at Trafford City, where part of a full scale frame was erected and flashed over with the lightning generator. Surges used for these tests made in 1930 rose to maximum value in 1.5 microseconds and fell to half value in 60 microseconds.

Auxiliary grounds to reduce resistance

A line insulated for 1,500 kv. is relatively highly insulated, but it cannot be considered proof against direct strokes of lightning. The grounding system of the Osage-Page line was made unusually complete for a wood frame line in an endeavor to limit potentials imposed on the conductors to values which could be controlled. Two overhead ground wires are carried along the line, one on the top of each pole. Each overhead ground wire is grounded at each structure by an earthing wire. Each earthing wire taps the overhead ground wire at a point 10 ft. from the pole, then jumps to a point on the pole 16 ft. below the crossarm and follows the pole to earth, forming complete metallic paths from the overhead ground wires to the bottoms of the pole holes. This expedient has been adopted in order to obtain the generally recognized benefits of the overhead ground wires without having them offset by short-circuited insulation, which has done so much in the past to discredit the use of overhead ground wires on wood structures.

The resistance of every earth connection was measured with the tap to the overhead ground wire disconnected. In all cases where the resistance measured more than 60 ohms auxiliary ground connections were provided to reduce the resistance to 60 ohms or less. This value was selected arbitrarily on an economic basis as it required the installation of auxiliary grounds at only about 13 per cent of the structures, the intention being to install additional grounds as experience should indicate their advisability. The experience has all been negative in this respect.

The structural design has not been dwelt upon in this article, but that it was successfully co-ordinated with the electrical design appears from the record, as there have been no interruptions to service chargeable to the line.

The Osage-Page lines were designed and built for the Union Electric Light & Power Company by the Stone & Webster Engineering Corporation.

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Taxes Eat 13 per Cent

As an example of the mounting tax burden imposed on the public through taxation for electric service, the following is quoted from the annual report of the Wisconsin Power & Light Company:

"The company paid into the public treasury, in the various forms of taxes assessed against it in 1932, the sum of $1,153,704.49. This sum is approximately 13 per cent of its total gross income and exceeded the amount of preferred dividends paid or accrued during 1932, which totaled $1,116,557.76.

"This mounting tax burden upon public utilities should be a matter of lively concern to every user of utility company service as well as to every investor in utility company securities, for if it continues either the rates for service must increase or the integrity of the investors' security cannot be maintained."

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READERS' FORUM

Disagrees on Expense of Self-Protecting Transformers

To the Editor of the ELECTRICAL WORLD:

I have read with interest the article entitled "Reducing Cost of Farm Lines" in the ELECTRICAL WORLD of February 18 and also M. J. Kelly's comments in the Readers' Forum of your issue of March 25. While some of Mr. Kelly's points are, no doubt, well taken, I would like to point out that I am unable to concur with Mr. Kelly's statement reading as follows:

> In view of the low cost of present-day arresters in the ranges of voltages most in use today for rural work, I am unable to quite follow the suggestion that they be replaced by self-protecting transformers, which are at present very considerably more expensive than the ordinary distribution transformer equipped with two (or one) lightning arresters, as the case may be.

The facts are that self-protecting transformers are sold by most of the leading manufacturers at a price not greater than the cost of a conventional transformer plus lightning arresters, and in some cases slightly under this cost.

When we add to the purchase price of the transformers and arresters the labor cost of installing arresters as individual units on the crossarm and also the labor of making necessary electrical connections, between the transformer and lightning arrester, the purchase of a self-protecting transformer is an economy on the part of the utility.

R. T. STAFFORD,
Assistant Manager Electrical Department.
Allis-Chalmers Manufacturing Company,
Pittsburgh Works, Pittsburgh, Pa.

Men of the Industry

CHARLES F. ADAMS, Secretary of the Navy in President Hoover's Cabinet, was elected a director of the General Electric Company at the annual meeting of stockholders held recently.

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CHARLES E. TULLAR, manager of the patent department of the General Electric Company, has been appointed a member of the advisory committee and of the engineering council of the company to succeed Albert G. Davis, who will retire May 1 from these offices and as vice-president in charge of patents.

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ALBERT G. CAGE, who has been connected with the Nevada-California Electric Corporation for nineteen years, has been appointed assistant general manager of that utility with headquarters at Riverside, Cal. Mr. Cage is also assistant general manager of the Southern Sierras Power Company, the Nevada-California Power Company and the Yuma Utilities Company.

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C. T. WILLIAMS, assistant general manager of the Sioux City (Iowa) Gas & Electric Company, has been appointed assistant general manager of the Sioux City Service Company, in active charge of the company. Mr. Williams succeeds the late E. L. Kirk, who died recently, after 43 years service. Mr. Williams has been associated with the Sioux City utilities for ten years.

•

GEORGE H. HOWARD, president of the United Corporation of Delaware, has resigned as a director in twelve corporations associated with the Electric Bond & Share Company, retaining, however, his position on the directorate of Electric Bond & Share. His resignation from the boards of the affiliated companies is due to the numerous demands upon his time as chief executive of the United Corporation and as a director of the Atlas Corporation.

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G. A. CHUTTER, formerly electrical engineer for the General Electric Company, Milwaukee, Wis., has recently opened an office as consulting engineer in this city. Mr. Chutter has been designing engineer in the turbine engineering and industrial engineering departments of the General Electric Company.

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EDWARD E. ASHLEY, formerly identified with Starrett & Van Vleck, architects, as electrical and mechanical engineer, has established offices in New York City for the general practice of electrical, mechanical and sanitary engineering, including Diesel and power plant equipment and modernization, air conditioning and elevators. Mr. Ashley is a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the New York Electrical Society and of other technical associations.

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T. I. PHILLIPS, formerly works manager of the Nuttall plant of the Westinghouse Electric & Manufacturing Company, has been appointed works manager of the East Pittsburgh works of the company. In addition to his new duties Mr. Phillips will remain in charge of the Nuttall plant in a supervisory capacity.

•

ALBERT G. DAVIS, vice-president of the General Electric Company in charge of patents, will retire on May 1, concluding more than 35 years of service with the organization. Upon his retirement Mr. Davis will enter the law firm of Pennie, Davis, Marvin & Edmonds, New York, specializing in patent work. A graduate of the Massachusetts Institute of Technology, from 1894 to 1896 he was connected with the United States Patent Office at Washington. In 1896, resigning from this work, he opened an office in Washington as a patent attorney, and in this interval he handled some patent work for the General Electric Company. It was in 1897 that he became manager of that company's patent department, and in recognition of his record in that office he was appointed a vice-president in 1919.

•

J. J. M. SMITH has been elected president of the Metropolitan Electrical League of Boston, succeeding Richard Lincoln. Mr. Smith is vice-president of the electrical contracting firm of Stearns, Perry & Smith, Boston, and is the first member of that branch of the industry to head the Boston league. He has been in the electrical field since 1901, specializing in electric motors.

•

PERCY J. PYBUS, C.B.E., M.P., has resigned the office of Minister of Transport in Great Britain's national government so that he may return to the electrical industry, with which he was previously connected. Before assuming ministerial office, he was chairman of the Power & Traction Finance Company, a vice-president of the British Electrical & Allied Manufacturers Association, the English Electric Company, Ltd., the Sudan Light & Power Company, Ltd., and the Wad Medani Light & Power Company, Ltd. As a young man Mr. Pybus joined Siemens Brothers as assistant to the manager of Siemens Brothers Dynamo Works, Ltd. In 1906, foreseeing the potentialities of electrical development in the Yorkshire industrial area, he acquired an interest in the Phoenix Dynamo Manufacturing Company, Ltd., Bradford, and in 1918, when the English Electric Company, Ltd., was formed, he joined the board as joint managing director, bringing the Phoenix Dynamo Manufacturing Company, Ltd., into the group as one of the constituent enterprises.

•

HENRY B. SAWYER, formerly treasurer of all companies under the executive management of Stone & Webster, later a member of the firm and upon its incorporation vice-president in charge of finances, has been elected president of Slayton-Learoyd, Inc., Boston, succeeding the late Hovey E. Slayton. Mr. Sawyer was associated with Store & Webster from 1890 to 1931. The organization which he now heads controls the distribution of Massachusetts Investors Trust shares.

•

H. W. COPE, formerly assistant director of engineering of the Westinghouse Electric & Manufacturing Company, has been named assistant to the vice-president, responsible for the co-ordination of certain headquarters engineering departments and district office engineers. Since joining the Westinghouse organization in 1898, following graduation from Franklin College and Purdue University, he has served successively in the testing department, in the engineering division, as manager of the alternating-current department, as assistant to the manager of the industrial department, as assistant to the manager of engineering and as assistant director of engineering.

•

CHARLES PIEZ, chairman of the board of Link Belt Company, Chicago, and active head of the organization for the past 27 years, is retiring from business and will move to Washington, D. C. He was one of the founders of the Illinois Manufacturers' Association and has played a prominent part in its activities for a number of years. Mr. Piez is a past-president of the American Society of Mechanical Engineers.

▼

OBITUARY

Anton G. Hodenpyl

Anton G. Hodenpyl, prominently identified with the electric light and power industry for a number of years, died April 23 at Richmond, Va., in his eighty-first year. In recent years Mr. Hodenpyl had restricted his business activities, but he was still a director in the J. G. White Engineering Corporation, J. G. White & Company, Inc.,

Matinecock Bank of Locust Valley and the Piping Rock Water Company at the time of his death. He had been president of the Commonwealth Power, Railway & Light Company, Michigan Light Company, Union Railway, Gas & Electric Company, Evansville Light Company, Peoria Light Company and Springfield (Ill.) Railway & Light Company. Most of these companies have been merged into the present Commonwealth & Southern Corporation. Mr. Hodenpyl organized the Michigan Trust Company of Grand Rapids, his native city, continuing as secretary and vice-president until 1901, when he moved to New York to become a member of King, Hodenpyl & Company, stock brokers. At the same time he assumed a partnership interest in Hodenpyl, Walbridge & Company, dealers in investment securities, which ten years later became Hodenpyl, Hardy & Company.

▼

PARK ELLIOTT, an electrical engineer connected with the General Electric Company in New York, died April 18, after a brief illness. He was a graduate of the University of Maine and a resident of Westfield, N. J.

•

FRANK W. MARSH, president of the Consolidated Electric Lamp Company, Champion Radio Works, Inc., and Dalton Marsh Company, all of Danvers and Lynn, Mass., died April 20. He was 61 years of age. Mr. Marsh had been connected with the incandescent lamp business for nearly 26 years and with the radio tube and electric heating industries for a long period. Most of Mr. Marsh's activities had been concerned with sales and merchandising.

•

HAROLD W. SMITH, until last June generating apparatus manager of the Westinghouse Electric & Manufacturing Company, died in Pittsburgh, March 28, after a brief illness. Born in Adelaide, South Australia, in 1886, he was graduated from the University of Adelaide, and after coming to this country continued his technical studies at Cornell University and at Columbia University. Entering the shop apprentice course with the Wagner Electric Manufacturing Company, he was later assigned to the transformer engineering department, but after a short period of time joined the Westinghouse Electric & Manufacturing Company. Connections followed with the Chicago, Lake Shore & South Bend Railway Company and the San Diego Consolidated Gas & Electric Company, and then he returned to his native country. In 1917 he again returned to the United States and for the next nine years was active in the general engineering department, before entering the generating apparatus sales department.

New Equipment Available

Explosion-Proof Motors

Explosion-proof motors, known as "U. S. Doublenclosed," have been announced by the U. S. Electrical Manufacturing Company, Los Angeles, Cal. These units have two inclosing frames with an unusually large fan mounted between two frames. The inner frame completely incloses the electrical windings, stator, rotor, anti-friction bearings and bearing chambers, sealing these vital parts against the intrusion of deteriorating substances. The outer frame completely covers and protects the whole unit.

▼

Small Circuit Breakers to Replace Fuses

A complete line of small circuit breakers, rated up to 600 volts and 600 amp., and designed for the control and production of industrial circuits, house-service entrance, branch circuits, refrigerators, ranges, etc., has been announced by the General Electric Company. In addition to offering such advantages as speedy restoration of service and tamper-proof protection, these breakers, designated as AF-1, employing a unique principle of arc interruption, operate quietly and permit no external arc, it is claimed. The interruption takes place within a closed metal chamber. When an overcurrent trips the breaker the contacts are disengaged within the metal chamber. The arc, which is drawn between the contacts, generates a pressure which increases the resistance of the arc path so rapidly that the circuit is interrupted in 0.008 second.

▼

Mercury Circuit Controller

A development in electrical circuit control known as the "Mercrelay," consisting of a heavy wall glass tube containing mercury, entering electrodes, a quartz cup and a displacement member, is being manufactured by the General Wire & Switch Company, Providence, R. I. The electrode at the bottom makes contact with the main body of mercury in the tube. The top electrode passes down through the tube and has secured at its end a fused quartz cup. This cup is partially immersed in the main pool of mercury. Floating on the mercury is a tubular member of magnetic susceptibility. The glass tube is placed within an electrical coil in such a manner that when the coil is energized the displacement member is drawn down by magnetic action, thereby raising the level of the mercury.

Maximum rating, intermittent or continuous non-inductive load is 25 amp. at 220 volts a.c. or d.c. The rating at interruptions in excess of ten per minute is 20 amp. at 220 volts a.c. or d.c. The "Mercrelay" can be supplied in both normally open or closed types.

▼

Automatic Reclosing Breaker

Self-contained reclosing equipment intended for lightly loaded or rural feeders has been announced by the Westinghouse Electric & Manufacturing Company. The equipment is incorporated in the type FO-22 breaker, 7,500 volts, with a 50,000 kva. interrupting capacity rating.

The breaker is conservatively rated, rugged and will withstand the severe service imposed by automatic reclosing duty, it is claimed. The automatic reclosing equipment is mounted within the breaker mechanism housing, making a self-contained equipment.

The entire equipment is built for pole installation, but can be set on floor-mounted framework if desired. The equipment is said to be economical in first cost and in maintenance, but reliable in operation.

▼

TO MEET THE EXACTING SERVICE of higher steam pressures, the Yarnall-Waring Company, Philadelphia, Pa., has developed a new form of laminated packing for use in "Yarway" seatless blow-off valves. This packing consists of several stainless steel rings with long fiber asbestos packing between them. At the time of assembly the mass is compressed and heat treated, so that the finished ring is a complete unit suitable for high pressures and temperatures. A slight clearance is maintained between the metal laminations and the valve plunger.

•

FOR USE IN METAL-CLAD SWITCHGEAR a new type of bus construction has been announced by the Delta-Star Electric Company, Chicago. The copper bars are inclosed in laminated paper insulation, "Lamphenite," wrapped under tension, and each layer is coated with phenolic varnish solidly pressed and cured in heated molds. This method of insulating eliminates voids, looseness, warps or cracks, and gives a uniformly laminated structure. Bus taps are pressure welded and joints completely incased with hot pressure molded insulation, same as the main bus.

ELECTRICAL WORLD

A consolidation of Electrical World, Electrical Engineer and American Electrician

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ALLEN M. PERRY
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A. E. KNOWLTON
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E. R. SEARLES
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G. F. WITTIG
Statistical Editor

EARL WHITEHORNE
Contributing Editor

JAMES H. RUDD
Publishing Director

FRANK R. INNES
Western Editor
520 N. Michigan Ave.
Chicago

C. W. LEIHY
Pacific Coast Editor
883 Mission St.
San Francisco

H. S. KNOWLTON
Contributing Editor
1427 Statler Bldg.
Boston

PAUL WOOTON
Washington
Correspondent
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Washington

What in the World!

We believe it to be a bad mistake for utilities to cease merchandising before they have built up other sales outlets. The Ithaca plan in this issue is one of several that show how to do co-operative merchandising.

●

Last week we showed a new conception of an outdoor steam station. This week we have 66-kv. generators proposed as practical. Europe is leading in the use of high-voltage generation and is also planning oil-clad switchgear for 132 kv.

●

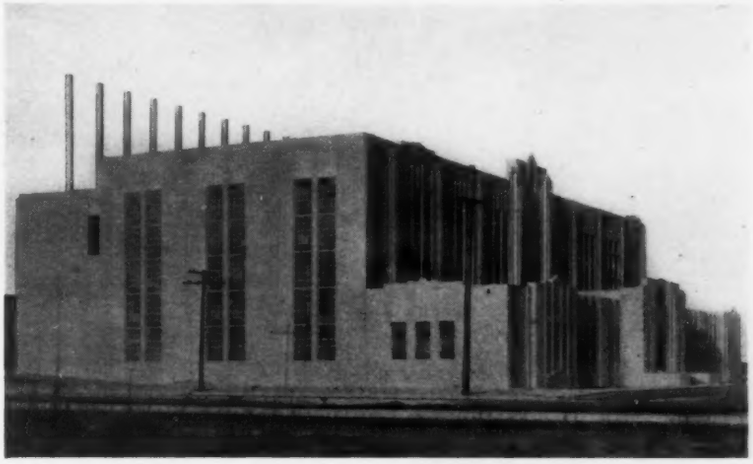
Many requests have been received for the article by Mr. Taylor discussing Diesel competition. We have a new Diesel governor introduced in this issue that should aid Diesel operation. The Diesel engine is a prime mover to be used in its economic place and it is being improved constantly—but so is the steam plant.

●

Convention season is approaching and Washington is affording ample topics for convention programs. We believe their discussions will be more competent and relevant than many discussions held in Congress. National affairs deserve and need treatment at conventions of business men.

●

The Century of Progress will be host to more than a thousand conventions—a dream city filled with color. Having been there, we believe every visitor will be interested and pleased and we think the conventions have an unusual opportunity to unite business with unusual pleasure.



Modern 35,000-kw. Diesel Station Vernon, Calif.

MAY 6, 1933

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Its light weight means economy and it cuts construction costs from start to finish.

Western Red Cedar poles mean—

Lower freight charges per pole

More poles per car or truck load

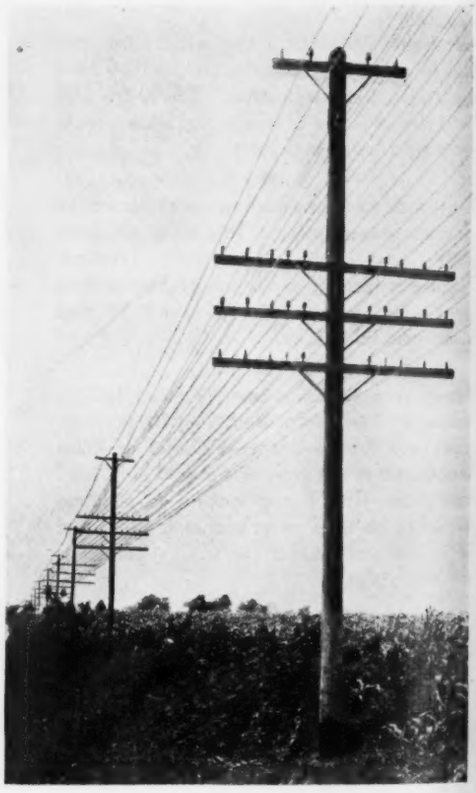
Less labor required for erection

More poles set per crew per day.

Lower cost of construction.

Their pronounced taper, together with the added weight of butt-treatment, practically eliminates realignment costs. They are not top heavy.

The light weight, long life, adaptability, strength and stability of Western Red Cedar poles effect a saving in construction and maintenance costs whether in the most difficult mountain location or in the easiest right-of-way.



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Play safe—specify

WESTERN RED CEDAR POLES

BUILT by NATURE

Table I—Data on Output and

in

Public utility, lighting, power and electric railway

Line No.	Company or System*	1932 Rank in 1932	1932 System Peak Load (30-Minute) Incl. Purchased Energy Kw. (See Note *a*)	1932 Peak Load on Generator Stations (30-Minute) Kw. (See Note *a*)	1932 Output for Year (Including Purchased Energy) Kw.-Hr.	1932 Average Load in Kw.	[illegible] System Peak Load (30-Minute) Incl. Purchased Energy Kw. (See Note *a*)	[illegible] Peak Gen Sta (30-M K (See
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
1	Niagara Hudson Power Corporation System (*C*)	1	(*o*) 923,368	(*o*) 796,400	5,378,434,187	613,000	998,876	
2	The New York Edison System (*H*)	2	1,189,400	1,189,400	4,981,200,000	567,500	1,240,000	1,
3	Pacific Gas & Electric Company	3	728,900	. . . . .	4,004,245,763	456,000	855,500	. . . . .
4	Commonwealth Edison Company	4	(*b*) 855,000	537,000	3,686,443,000	420,000	(*b*) 902,500	
5	Philadelphia Electric Company System	5	. . . . .	626,000	2,860,721,532	325,800	. . . . .	
6	Southern California Edison Company Ltd	6	516,500	514,400	2,856,602,851	325,000	558,200	
7	Public Service Electric & Gas Company (N. J.)	7	456,100	373,850	2,037,604,869	232,000	462,700	
8	New England Power Association System	8	(*o*) 467,300	. . . . .	2,032,576,325	231,500	(*o*) 484,000	. . . . .
9	The Detroit Edison Company	9	420,300	. . . . .	1,851,223,900	210,800	477,700	. . . . .
10	The North American Co. Sys. (Mo.-Ill. and Iowa Group)	10	329,506	. . . . .	1,650,408,229	188,000	384,324	. . . . .
11	Duke Power Company	11	405,400	334,300	1,649,582,952	187,900	412,000	
12	The West Penn Electric Company Subsidiaries	12	(*o*) 260,971	. . . . .	1,457,715,339	166,000	(*o*) 306,845	. . . . .
13	Alabama Power Company	13	389,120	343,400	1,406,939,956	160,200	(*o*) 402,810	. . . . .
14	The Ohio Power Company	14	289,250	289,250	1,399,680,283	159,500	242,000	
15	Pennsylvania Power & Light Company	15	(*o*) 281,600	(*o*) 229,200	1,382,587,998	157,400	(*o*) 291,600	(*o*)
16	Public Service Company of Northern Illinois	16	173,470	(*j*) 223,476	1,331,986,990	151,700	191,661	(*j*)
17	Super-Power Company of Illinois	17	237,600	223,000	1,232,552,866	140,400	236,700	
18	The Cleveland Electric Illuminating Company	18	283,900	. . . . .	1,201,175,042	136,900	309,556	. . . . .
19	Duquesne Light Company	19	245,000	245,000	1,176,868,998	134,000	289,000	
20	Georgia Power Company	20	(*o*) 275,660	(*o*) 268,170	1,163,107,611	132,500	270,000	. . . . .
21	Appalachian Electric Power Company (*E*)	21	207,680	166,130	1,135,486,426	129,300	231,730	
22	Columbia Gas & Electric Corporation System	22	249,900	. . . . .	1,072,227,180	123,100	266,540	. . . . .
23	The Edison Electric Illuminating Company of Boston	23	265,563	213,000	1,048,824,142	119,400	281,787	
24	Northern States Power Company (Del.) Subsidiaries	24	204,461	. . . . .	974,484,310	111,000	227,971	. . . . .
25	The North American Co. System (Wis., Michigan Group)	25	231,969	. . . . .	971,760,512	110,700	261,322	. . . . .
26	Chicago District Electric Generating Corporation	26	190,848	190,848	940,504,000	107,200	191,232	
27	Pennsylvania Wtr.& Pwr. Co. and Safe Harbor Wtr.Pwr. Corp.(*f*)	27	(*o*) 222,100	(*o*) 222,100	933,430,500	106,400	(*o*) 126,500	(*o*)
28	Consumers Power Company	28	237,343	197,592	894,759,956	101,800	242,700	. . . . .
29	Consolidated Gas Electric Light & Power Co. of Baltimore	29	(*o*) 180,400	(*o*) 119,900	843,522,718	96,000	(*o*) 181,500	(*o*)
30	Puget Sound Power & Light Company	30	177,255	148,763	824,481,187	93,800	185,630	. . . . .
31	Carolina Power & Light Company	31	(*o*) 208,600	(*o*) 178,750	814,270,505	92,700	(*o*) 217,000	(*o*)
32	City of Los Angeles, Bureau of Power & Light	32	167,400	94,500	722,331,128	82,200	169,000	
33	Ohio Edison Company	33	(*o*) 153,000	(*o*) 134,700	693,551,026	79,000	. . . . .	. . . . .
34	Assoc. Gas & Elec. System (Eastern Pa. & N. J. Group) (*c*)	34	(*o*) 143,860	(*o*) 125,590	664,678,386	75,600	(*o*) 151,870	(*o*)
35	The Washington Water Power Company	35	128,135	128,135	647,596,251	73,700	(*o*) 152,420	(*o*)
36	Kansas City Power & Light Company	36	128,200	. . . . .	615,730,828	70,100	131,000	. . . . .
37	The Montana Power Company	37	119,700	119,700	613,026,278	69,800	145,700	
38	Louisiana Power & Light Company	38	112,988	103,000	551,155,000	62,700	112,091	
39	The North American Co. System (District of Columbia Group)	39	137,000	137,000	542,527,569	61,750	130,000	
40	The Tennessee Electric Power Company	40	145,740	106,260	536,913,727	61,100	165,000	. . . . .
41	The Connecticut Electric Service Company System	41	(*o*) 114,425	. . . . .	536,775,777	61,100	(*o*) 115,241	. . . . .
42	Public Service Company of Indiana* (*L*)	42	116,980	. . . . .	533,569,196	60,800	72,588	
43	Portland General Electric Company	43	(*o*) 108,300	(*o*) 126,000	514,789,600	58,600	(*o*) 130,900	(*o*)
44	Virginia Electric & Power Company	44	104,200	97,500	507,496,464	57,750	107,600	. . . . .
45	Hetch Hetchy Water Supply (San Francisco)	45	83,600	83,600	507,323,840	57,700	83,600	
46	Utah Power & Light Company	46	103,710	67,160	493,678,000	56,200	119,390	
47	The California Oregon Power Company	47	84,700	81,795	471,471,767	53,700	92,425	
48	Illinois Power & Light Corporation (Illinois)	48	99,000	. . . . .	458,877,819	52,260	99,000	. . . . .
49	Texas Electric Service Company	49	(*o*) 83,622	(*o*) 82,152	452,534,000	51,550	(*o*) 86,190	(*o*)
50	Houston Lighting & Power Company	50	(*o*) 82,600	(*o*) 79,500	435,971,000	49,600	(*o*) 96,210	(*o*)
51	Texas Power & Light Company	51	(*o*) 102,540	(*o*) 82,630	435,440,000	49,550	(*o*) 105,225	(*o*)
52	Western Massachusetts Companies System	52	76,700	. . . . .	433,146,000	49,300	86,100	
53	Oklahoma Gas & Electric Company	53	83,152	. . . . .	430,351,857	49,000	99,494	
54	N. Y. State Elec. & Gas Corp. Group (Assoc. G. & E. System)	54	(*o*) 74,500	(*o*) 38,000	412,760,797	47,000	(*o*) 89,500	(*o*)
55	Louisville Gas & Electric Company (Del.) Subsidiaries	55	. . . . .	. . . . .	410,323,910	45,700	. . . . .	. . . . .
56	Indiana & Michigan Electric Company	56	110,500	87,620	408,462,952	46,600	126,160	
57	Assoc. Gas & Elec. System (South Carolina Group) (*h*)	57	(*o*) 117,700	(*o*) 117,700	397,764,719	45,250	(*o*) 123,900	(*o*)

Supplement to ELECTRICAL WORLD, May 6, 1933

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l Peak Load of Largest Generating and Distributing
n North America, 1926—1932

ay systems in the United States, Canada and Mexico having output in excess of 100,000,000 kw.-hr. during 1932 or earlier year

1931			1930				1929			1928	
Peak Load on Generator Stations (30-Minute) Kw. (See Note *a*) (9)	Output for Year (Including Purchased Energy) Kw.-Hr. (10)	Average Load in Kw. (11)	System Peak Load (Instantaneous) Kw. (See Note *a*) (12)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (13)	Output for Year (Including Purchased Energy) Kw.-Hr. (14)	Average Load in Kw. (15)	System Peak Load (Instantaneous) Kw. (See Note *a*) (16)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (17)	Output for Year (Including Purchased Energy) Kw.-Hr. (18)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (19)	
850,218	5,911,409,390	675,000	.....	1,091,910	6,892,316,698	786,600	1,148,600	.....	7,212,743,072	.....	
1,240,000	5,138,200,000	586,000	1,248,000	1,226,000	4,983,500,000	568,800	1,225,000	1,209,000	4,678,700,000	1,125,000	4,2
.....	4,558,552,038	520,000	.....	853,300	4,546,499,302	519,000	513,800	.....	2,717,874,472	(*m*) 484,600	2,5
616,550	4,226,257,000	482,000	1,030,900	969,800	4,582,510,000	523,100	1,028,500	1,000,200	4,636,434,000	1,016,000	4,1
668,000	3,032,323,879	346,000	(*G*) 699,000	(*G*) 670,000	3,091,233,131	352,900	(*G*) 740,000	(*G*) 713,000	3,029,885,631	561,400	2,2
554,900	3,061,836,977	349,500	582,900	.....	3,168,973,397	361,000	571,000	.....	3,162,988,030	(*m*) 516,100	2,7
366,500	2,170,512,600	247,800	540,500	506,500	2,173,944,354	248,000	536,600	517,225	2,134,581,298	471,000	1,8
.....	1,987,327,572	226,800	438,800	411,000	1,590,215,715	181,500	406,300	395,000	1,703,536,819	315,000	1,3
.....	2,170,254,600	247,700	.....	526,800	2,384,528,500	272,000	.....	547,600	2,654,901,300	507,700	2,4
.....	1,868,194,882	213,000	370,072	.....	1,954,460,032	223,000	350,000	.....	1,871,797,392	(*m*) 355,611	1,7
322,000	1,768,184,411	201,800	421,000	421,000	1,762,798,306	201,000	432,000	432,000	1,981,239,709	422,600	1,8
.....	1,693,855,089	193,300	.....	345,720	1,875,470,490	214,000	.....	362,787	1,938,955,818	319,325	1,7
.....	1,860,805,943	212,500	.....	416,750	1,707,945,749	195,000	.....	376,400	1,715,250,122	338,600	1,5
326,000	1,456,252,361	166,200	262,000	.....	1,479,180,000	168,900	276,000	.....	1,544,252,000	(*m*) 224,000	1,3
) 231,200	1,483,177,247	169,300	.....	298,500	1,443,264,200	164,750	.....	285,800	1,251,104,868	(*m*) 253,000	1,1
) 195,545	1,361,938,056	155,500	.....	186,869	1,361,763,671	155,300	.....	190,123	1,246,330,283	178,016	1,0
231,800	1,253,830,208	143,100	.....	158,400	729,805,500	83,250	.....	.....	.....	.....	
.....	1,316,116,027	150,200	323,367	.....	1,370,467,732	156,300	315,870	.....	1,447,193,594	(*m*) 331,768	1,2
289,000	1,364,318,513	155,800	308,000	304,000	1,510,950,299	172,480	.....	.....	1,573,445,327	(*m*) 295,300	1,4
.....	1,319,011,309	150,600	306,540	301,955	1,364,739,226	155,800	.....	257,125	1,146,516,743	223,700	9
234,000	1,276,642,108	145,700	280,600	.....	1,613,396,000	184,100	265,000	.....	1,484,761,000	(*m*) 230,000	1,2
.....	1,162,409,020	132,700	262,000	262,000	1,161,459,375	132,300	263,000	261,000	1,203,652,405	249,000	1,0
231,210	1,048,605,842	119,700	289,017	.....	1,073,796,288	122,500	275,501	.....	1,041,388,668	(*m*) 252,777	8
.....	1,064,002,895	121,500	233,533	210,000	1,024,205,047	116,900	.....	.....	969,071,015	.....	9
.....	1,125,840,103	128,500	276,586	.....	1,243,228,676	141,900	284,359	.....	1,311,738,004	(*m*) 262,860	1,1
191,232	1,009,506,000	115,200	200,000	198,324	1,039,422,000	118,500	165,400	163,900	(*I*) 430,779,000	.....	
) 126,500	506,218,600	57,800	132,000	127,900	527,694,000	60,240	134,000	129,600	610,962,200	124,500	6
.....	1,016,384,395	116,000	254,731	248,000	1,072,090,387	122,500	271,052	270,772	1,198,947,711	230,000	1,1
) 162,500	884,250,577	100,900	.....	188,200	933,093,920	106,500	.....	186,000	910,934,486	167,900	8
.....	911,955,295	104,100	.....	192,623	980,325,415	111,900	193,392	.....	941,992,205	(*m*) 169,219	8
) 171,300	731,648,290	83,500	190,500	188,000	564,056,174	64,400	.....	108,000	476,878,300	(*m*) 107,000	4
84,700	759,028,656	86,600	171,300	170,000	759,852,996	86,600	162,000	161,000	722,998,796	152,000	6
.....	849,713,467	96,900	.....	.....	980,578,309	112,000	.....	.....	.....	.....	
) 151,870	706,351,308	80,600	165,000	158,140	725,194,632	82,750	165,000	158,320	735,612,022	143,500	6
) 152,420	784,134,417	89,500	.....	155,960	850,025,000	97,000	.....	172,735	858,353,000	.....	7
.....	629,935,369	71,900	.....	136,200	647,940,872	73,960	139,400	132,400	645,165,032	120,300	5
145,700	937,014,000	107,000	216,000	216,000	1,293,449,000	147,600	.....	229,800	1,611,521,000	.....	1,5
96,151	612,119,000	69,900	108,361	108,361	596,413,000	68,000	.....	110,464	511,225,000	.....	3
130,000	519,295,192	59,300	123,000	.....	488,533,981	55,800	120,000	118,000	449,794,685	108,000	4
.....	762,528,751	87,000	158,155	150,965	783,433,211	89,500	165,000	157,600	819,723,857	145,300	7
.....	552,059,756	63,000	.....	115,629	568,625,609	64,800	.....	123,915	580,426,439	.....	4
40,775	320,594,122	36,600	.....	.....	.....	.....	.....	.....	.....	.....	
) 130,400	603,182,100	68,800	.....	128,000	589,240,400	67,300	.....	123,600	603,423,300	128,500	5
.....	534,628,983	61,000	.....	108,100	514,453,563	58,700	105,000	101,800	480,970,175	95,100	4
83,600	309,450,010	35,300	.....	83,600	493,888,420	56,250	83,400	83,400	464,339,110	82,400	5
100,500	650,549,000	74,300	135,405	.....	746,475,000	85,200	.....	142,505	882,360,000	(*m*) 132,390	8
81,760	465,156,805	53,100	83,540	.....	476,173,234	54,300	94,575	.....	410,083,711	.....	4
.....	506,145,010	57,800	.....	102,050	533,762,511	60,900	.....	108,300	542,629,220	105,000	4
) 82,720	521,669,355	59,500	73,933	71,780	568,018,000	64,800	.....	.....	665,625,000	(*m*) 67,494	3
) 93,100	524,913,000	59,900	107,235	103,900	566,409,000	64,700	.....	96,205	510,247,000	(*m*) 82,600	4
) 89,890	445,325,000	50,800	101,000	98,405	440,721,000	50,300	.....	102,780	442,818,000	.....	3
85,100	443,000,000	50,500	93,100	93,100	476,000,000	54,300	.....	105,100	494,805,982	.....	
95,530	489,174,640	55,800	117,320	114,500	643,486,718	73,450	.....	.....	692,070,936	.....	5
) 33,500	430,009,374	49,100	.....	.....	444,904,828	50,800	.....	.....	377,746,958	.....	
.....	450,407,520	51,400	91,235	.....	348,598,452	39,800	.....	.....	328,598,520	.....	2
95,620	491,439,695	56,100	120,860	.....	530,316,000	60,500	106,190	.....	538,734,000	(*m*) 91,560	4
) 123,900	425,907,556	48,600	68,000	65,100	178,976,937	20,400	55,000	53,200	162,129,679	54,800	1
71,000	455,840,667	52,000	.....	.....	575,727,000	65,700	.....	.....	.....	.....	

56	Indiana & Michigan Electric Company	56		110,500		87,620	408,462,952	46,600		126,160				
57	Assoc. Gas & Elec. System (South Carolina Group) (*h*)	57	(*o*)	117,700	(*o*)	117,700	397,764,719	45,250	(*o*)	123,900	(*o*)			
58	Ohio Public Service Company	58	(*o*)	90,300	(*o*)	56,200	395,239,555	45,000	(*o*)	103,200	(*o*)			

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Data on Output and Peak Load of Largest Genera in North America, 1926—1932

Public utility, lighting, power and electric railway systems in the United States, Canada and Mexico having output in excess of 100,0

1932				1931				1930			
m oad ute) chased gy te *a*)	Peak Load on Generator Stations (30-Minute) Kw. (See Note *a*) (5)	Output for Year (Including Purchased Energy) Kw.-Hr. (6)	Average Load in Kw. (7)	System Peak Load (30-Minute) Incl. Purchased Energy Kw. (See Note *a*) (8)	Peak Load on Generator Stations (30-Minute) Kw. (See Note *a*) (9)	Output for Year (Including Purchased Energy) Kw.-Hr. (10)	Average Load in Kw. (11)	System Peak Load (Instantaneous) Kw. (See Note *a*) (12)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (13)	Output for Year (Including Purchased Energy) Kw.-Hr. (14)	Average Load in Kw. (15)
3,368	(*o*) 796,400	5,378,434,187	613,000	998,876	850,218	5,911,409,390	675,000	.....	1,091,910	6,892,316,698	786,600
9,400	1,189,400	4,981,200,000	567,500	1,240,000	1,240,000	5,138,200,000	586,000	1,248,000	1,226,000	4,983,500,000	568,800
8,900	.....	4,004,245,763	456,000	855,500	.....	4,558,552,038	520,000	.....	853,300	4,546,499,302	519,000
5,000	537,000	3,686,443,000	420,000	(*b*) 902,500	616,550	4,226,257,000	482,000	1,030,900	969,800	4,582,510,000	523,100
.....	626,000	2,860,721,532	325,800	.....	668,000	3,032,323,879	346,000	(*G*) 699,000	(*G*) 670,000	3,091,233,131	352,900
6,500	514,400	2,856,602,851	325,000	558,200	554,900	3,061,836,977	349,500	582,900	.....	3,168,973,397	361,000
6,100	373,850	2,037,604,869	232,000	462,700	366,500	2,170,512,600	247,800	540,500	506,500	2,173,944,354	248,000
7,300	.....	2,032,576,325	231,500	(*o*) 484,000	.....	1,987,327,572	226,800	438,800	411,000	1,590,215,715	181,500
0,300	.....	1,851,223,900	210,800	477,700	.....	2,170,254,600	247,700	.....	526,800	2,384,528,500	272,000
9,506	.....	1,650,408,229	188,000	384,324	.....	1,868,194,882	213,000	370,072	.....	1,954,460,032	223,000
5,400	334,300	1,649,582,952	187,900	412,000	322,000	1,768,184,411	201,800	421,000	421,000	1,762,798,306	201,000
0,971	.....	1,457,715,339	166,000	(*o*) 306,845	.....	1,693,855,089	193,300	.....	345,720	1,875,470,490	214,000
9,120	343,400	1,406,939,956	160,200	(*o*) 402,810	.....	1,860,805,943	212,500	.....	416,750	1,707,945,749	195,000
9,250	289,250	1,399,680,283	159,500	242,000	326,000	1,456,252,361	166,200	262,000	.....	1,479,180,000	168,900
1,600	(*o*) 229,200	1,382,587,998	157,400	(*o*) 291,600	(*o*) 231,200	1,483,177,247	169,300	.....	298,500	1,443,264,200	164,750
3,470	(*j*) 223,476	1,331,986,990	151,700	191,661	(*j*) 195,545	1,361,938,056	155,500	.....	186,869	1,361,763,671	155,300
7,600	223,000	1,232,552,866	140,400	236,700	231,800	1,253,830,208	143,100	.....	158,400	729,805,500	83,250
3,900	.....	1,201,175,042	136,900	309,556	.....	1,316,116,027	150,200	323,367	.....	1,370,467,732	156,300
5,000	245,000	1,176,868,998	134,000	289,000	289,000	1,364,318,513	155,800	308,000	304,000	1,510,950,299	172,480
5,660	(*o*) 268,170	1,163,107,611	132,500	270,000	.....	1,319,011,309	150,600	306,540	301,955	1,364,739,226	155,800
7,680	166,130	1,135,486,426	129,300	231,730	234,000	1,276,642,108	145,700	280,600	.....	1,613,396,000	184,100
9,900	.....	1,072,227,180	123,100	266,540	.....	1,162,409,020	132,700	262,000	262,000	1,161,459,375	132,300
5,563	213,000	1,048,824,142	119,400	281,787	231,210	1,048,605,842	119,700	289,017	.....	1,073,796,288	122,500
4,461	.....	974,484,310	111,000	227,971	.....	1,064,002,895	121,500	233,533	210,000	1,024,205,047	116,900
1,969	.....	971,760,512	110,700	261,322	.....	1,125,840,103	128,500	276,586	.....	1,243,228,676	141,900
0,848	190,848	940,504,000	107,200	191,232	191,232	1,009,506,000	115,200	200,000	198,324	1,039,422,000	118,500
2,100	(*o*) 222,100	933,430,500	106,400	(*o*) 126,500	(*o*) 126,500	506,218,600	57,800	132,000	127,900	527,694,000	60,240
7,343	197,592	894,759,956	101,800	242,700	.....	1,016,384,395	116,000	254,731	248,000	1,072,090,387	122,500
0,400	(*o*) 119,900	843,522,718	96,000	(*o*) 181,500	(*o*) 162,500	884,250,577	100,900	.....	188,200	933,093,920	106,500
7,255	148,763	824,481,187	93,800	185,630	.....	911,955,295	104,100	.....	192,623	980,325,415	111,900
8,600	(*o*) 178,750	814,270,505	92,700	(*o*) 217,000	(*o*) 171,300	731,648,290	83,500	190,500	188,000	564,056,174	64,400
7,400	94,500	722,331,128	82,200	169,000	84,700	759,028,656	86,600	171,300	170,000	759,852,996	86,600
3,000	(*o*) 134,700	693,551,026	79,000	.....	.....	849,713,467	96,900	.....	.....	980,578,309	112,000
3,860	(*o*) 125,590	664,678,386	75,600	(*o*) 151,870	(*o*) 151,870	706,351,308	80,600	165,000	158,140	725,194,632	82,750
8,135	128,135	647,596,251	73,700	(*o*) 152,420	(*o*) 152,420	784,134,417	89,500	.....	155,960	850,025,000	97,000
8,200	.....	615,730,828	70,100	131,000	.....	629,935,369	71,900	.....	136,200	647,940,872	73,960
9,700	119,700	613,026,278	69,800	145,700	145,700	937,014,000	107,000	216,000	216,000	1,293,449,000	147,600
2,988	103,000	551,155,000	62,700	112,091	96,151	612,119,000	69,900	108,361	108,361	596,413,000	68,000
7,000	137,000	542,527,569	61,750	130,000	130,000	519,295,192	59,300	123,000	.....	488,533,981	55,800
5,740	106,260	536,913,727	61,100	165,000	.....	762,528,751	87,000	158,155	150,965	783,433,211	89,500
4,425	.....	536,775,777	61,100	(*o*) 115,241	.....	552,059,756	63,000	.....	115,629	568,625,609	64,800
6,980	.....	533,569,196	60,800	72,588	40,775	320,594,122	36,600	.....	.....	.....	.....
8,300	(*o*) 126,000	514,789,600	58,600	(*o*) 130,900	(*o*) 130,400	603,182,100	68,800	.....	128,000	589,240,400	67,300
4,200	97,500	507,496,464	57,750	107,600	.....	534,628,983	61,000	.....	108,100	514,453,563	58,700
3,600	83,600	507,323,840	57,700	83,600	83,600	309,450,010	35,300	.....	83,600	493,888,420	56,250
3,710	67,160	493,678,000	56,200	119,390	100,500	650,549,000	74,300	135,405	.....	746,475,000	85,200
4,700	81,795	471,471,767	53,700	92,425	81,760	465,156,805	53,100	83,540	.....	476,173,234	54,300
9,000	.....	458,877,819	52,260	99,000	.....	506,145,010	57,800	.....	102,050	533,762,511	60,900
3,622	(*o*) 82,152	457,534,000	51,550	(*o*) 86,190	(*o*) 82,720	521,669,355	59,500	73,933	71,780	568,018,000	64,800
2,600	(*o*) 79,500	435,971,000	49,600	(*o*) 96,210	(*o*) 93,100	524,913,000	59,900	107,235	103,900	566,409,000	64,700
2,540	(*o*) 82,630	435,440,000	49,550	(*o*) 105,225	(*o*) 89,890	445,325,000	50,800	101,000	98,405	440,721,000	50,300
6,700	.....	433,146,000	49,300	86,100	85,100	443,000,000	50,500	93,100	93,100	476,000,000	54,300
3,152	.....	430,351,857	49,000	99,494	95,530	489,174,640	55,800	117,320	114,500	643,486,718	73,450
4,500	(*o*) 38,000	412,760,797	47,000	(*o*) 89,500	(*o*) 33,500	430,009,374	49,100	.....	.....	444,904,828	50,800
.....	.....	410,323,910	45,700	.....	.....	450,407,520	51,400	91,235	.....	348,598,452	39,800
0,500	87,620	408,462,952	46,600	126,160	95,620	491,439,695	56,100	120,860	.....	530,316,000	60,500
7,700	(*o*) 117,700	397,764,719	45,250	(*o*) 123,900	(*o*) 123,900	425,907,556	48,600	68,000	65,100	178,976,937	20,400

rating and Distributing Systems

2

0,000,000 kw.-hr. during 1932 or earlier year

	1929			1928		1927		1926		
	System Peak Load (Instantaneous) Kw. (See Note *a*) (16)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (17)	Output for Year (Including Purchased Energy) Kw.-Hr. (18)	System Peak Load (Over 30-Minute Period) Kw. (See Note *a*) (19)	Output for Year (Including Purchased Energy) Kw.-Hr. (20)	System Peak Load (Instantaneous) Kw. (See Note *a*) (21)	Output for Year (Including Purchased Energy) Kw.-Hr. (22)	Peak Load (Instantaneous) Kw. (See Note *a*) (23)	Output for Year Kw.-Hr. (24)	Line No. (25)
,600	1,148,600	.....	7,212,743,072	.....	.....	.....	.....	.....	.....	1
,800	1,225,000	1,209,000	4,678,700,000	1,125,000	4,210,700,000	784,077	2,877,090,621	731,964	2,554,025,704	2
,000	513,800	.....	2,717,874,472	(*m*) 484,600	2,545,713,564	439,568	2,322,015,035	406,970	2,157,886,980	3
,100	1,028,500	1,000,200	4,636,434,000	1,016,000	4,174,661,000	952,000	3,778,380,000	897,000	3,482,632,000	4
,900	(*G*) 740,000	(*G*) 713,000	3,029,885,631	561,400	2,266,856,345	455,000	1,860,613,091	444,000	1,749,016,316	5
,000	571,000	.....	3,162,988,030	(*m*) 516,100	2,762,459,843	448,900	2,421,357,098	422,700	2,227,879,772	6
,000	536,600	517,225	2,134,581,298	471,000	1,879,024,063	435,500	1,701,886,359	415,000	1,560,801,782	7
,500	406,300	395,000	1,703,536,819	315,000	1,384,834,239	(*o*) 243,650	1,104,515,942	(*o*) 179,200	716,087,950	8
,000	.....	547,600	2,654,901,300	507,700	2,438,304,900	447,500	2,142,549,100	439,000	2,025,063,700	9
,000	350,000	.....	1,871,797,392	(*m*) 355,611	1,719,825,708	319,599	1,449,881,883	278,121	1,337,733,243	10
,000	432,000	432,000	1,981,239,709	422,600	1,847,072,621	(*n*) 398,300	1,745,776,428	(*o*) 337,040	1,433,759,975	11
,000	.....	362,787	1,938,955,818	319,325	1,764,742,160	(*o*) 332,405	1,727,565,353	(*o*) 313,040	1,514,609,984	12
,000	.....	376,400	1,715,250,122	338,600	1,586,177,553	(*n*) 248,280	1,759,143,119	.....	.....	13
,900	276,000	.....	1,544,252,000	(*m*) 224,000	1,305,004,000	211,000	1,131,133,000	202,000	1,109,315,094	14
,750	.....	285,800	1,251,104,868	(*m*) 253,000	1,176,653,000	203,002	908,579,200	194,402	858,001,300	15
,300	.....	190,123	1,246,330,283	178,016	1,047,466,830	(*n*, *G*) 154,044	884,762,116	(*n*, *G*) 139,809	720,018,554	16
,250	.....	.....	.....	.....	.....	.....	.....	.....	.....	17
,300	315,870	.....	1,447,193,594	(*m*) 331,768	1,282,476,855	293,731	1,138,838,831	287,119	1,118,294,193	18
,480	.....	.....	1,573,445,327	(*m*) 295,300	1,434,185,024	276,900	1,328,526,578	284,260	1,332,033,978	19
,800	.....	257,125	1,146,516,743	223,700	909,962,847	(*n*) 185,000	697,306,888	.....	.....	20
,100	265,000	.....	1,484,761,000	(*m*) 230,000	1,270,328,000	216,000	1,095,378,000	205,000	975,664,102	21
,300	263,000	261,000	1,203,652,405	249,000	1,052,549,327	213,000	936,704,222	.....	.....	22
,500	275,501	.....	1,041,388,668	(*m*) 252,777	857,209,496	224,508	748,502,053	190,276	673,760,354	23
,900	.....	.....	969,071,015	.....	908,760,906	.....	839,375,628	181,677	805,380,692	24
,900	284,359	.....	1,311,738,004	(*m*) 262,860	1,148,886,380	229,314	1,026,886,645	210,420	959,430,412	25
,500	165,400	163,900	(*I*) 430,779,000	.....	.....	.....	.....	.....	.....	26
,240	134,000	129,600	610,962,200	124,500	655,035,700	127,000	634,248,100	120,000	631,681,400	27
,500	271,052	270,772	1,198,947,711	230,000	1,102,278,322	225,919	930,285,847	118,113	809,134,896	28
,500	.....	186,000	910,934,486	167,900	825,430,643	(*o*) 165,000	786,877,691	(*o*) 162,500	802,768,634	29
,900	193,392	.....	941,992,205	(*m*) 169,219	877,953,546	158,453	787,258,688	135,665	708,450,887	30
,400	.....	108,000	476,878,300	(*m*) 107,000	430,427,600	101,000	426,426,000	95,000	426,399,670	31
,600	162,000	161,000	722,998,796	152,000	639,415,709	133,300	584,279,702	121,700	521,136,258	32
,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	33
,750	165,000	158,320	735,612,022	143,500	645,621,149	140,000	782,173,960	150,000	937,689,159	34
,000	.....	172,735	858,353,000	.....	746,709,000	128,120	633,019,740	103,783	571,833,994	35
,960	139,400	132,400	645,165,032	120,300	584,714,544	120,806	488,156,281	73,200	365,170,871	36
,600	.....	229,800	1,611,521,000	.....	1,583,985,000	191,100	1,366,997,834	188,400	1,379,194,095	37
,000	.....	110,464	511,225,000	.....	390,533,000	.....	250,542,000	34,000	122,937,000	38
,800	120,000	118,000	449,794,685	108,000	413,992,663	101,000	383,128,587	91,500	350,024,224	39
,500	165,000	157,600	819,723,857	145,300	730,061,103	137,800	651,397,468	136,800	653,812,207	40
,800	.....	123,915	580,426,439	.....	445,804,848	.....	354,047,654	(*o*) 69,870	286,218,156	41
	.....	.....	.....	.....	.....	.....	.....	.....	.....	42
,300	.....	123,600	603,423,300	128,500	549,922,100	(*o*) 120,900	495,663,700	121,300	476,272,500	43
,700	105,000	101,800	480,970,175	95,100	440,886,606	(*n*) 88,200	409,680,096	(*n*) 82,300	377,662,174	44
,250	83,400	83,400	464,339,110	82,400	528,895,495	.....	.....	.....	.....	45
,200	.....	142,505	882,360,000	(*m*) 132,390	830,862,000	118,678	784,402,000	120,270	801,444,000	46
,300	94,575	.....	410,083,711	.....	441,845,615	.....	374,724,290	67,040	293,010,721	47
,900	.....	108,300	542,629,220	105,000	491,171,956	.....	.....	.....	.....	48
,800	.....	.....	665,625,000	(*m*) 67,494	381,404,000	.....	241,723,000	.....	.....	49
,700	.....	96,205	510,247,000	(*m*) 82,600	436,633,000	75,000	362,094,000	56,000	263,299,360	50
,300	.....	102,780	442,818,000	.....	374,563,000	84,200	355,707,000	76,300	339,468,000	51
,300	.....	105,100	494,805,982	.....	.....	.....	.....	.....	.....	52
,450	.....	.....	692,070,936	.....	567,869,411	.....	399,543,412	54,942	207,140,920	53
,800	.....	.....	377,746,958	.....	.....	.....	.....	.....	.....	54
,800	.....	.....	328,598,520	.....	285,767,900	.....	234,238,160	.....	222,310,255	55
,500	106,190	.....	538,734,000	(*m*) 91,560	454,600,000	90,110	390,808,000	91,490	318,395,010	56
,400	55,000	53,200	162,129,679	54,800	148,932,217	.....	.....	.....	.....	57

10,500	87,620	408,462,952	46,600		126,160		95,620	491,439,695		56,100	120,860			530,316,000		60,5
17,700	(a)	397,764,719	45,250	(a)	123,900	(a)	123,900	425,907,556		48,600	68,000		65,100	178,976,937		20,4

46	Utah Power & Light Company	46		103,710		67,160	493,678,000		56,200		119,390					
47	The California Oregon Power Company	47		84,700		81,795	471,471,767		53,700		92,425					
48	Illinois Power & Light Corporation (Illinois)	48		99,000		.....	458,872,819		52,260		99,000		.....			
49	Texas Electric Service Company	49	(a)	83,622	(a)	82,152	457,534,000		51,550	(a)	86,190	(a)				
50	Houston Lighting & Power Company	50	(a)	82,600	(a)	79,500	435,971,000		49,600	(a)	96,210	(a)				
51	Texas Power & Light Company	51	(a)	102,540	(a)	82,630	435,440,000		49,550	(a)	105,225	(a)				
52	Western Massachusetts Companies System	52		76,700		.....	433,146,000		49,300		86,100					
53	Oklahoma Gas & Electric Company	53		83,152		.....	430,351,857		49,000		99,494					
54	N. Y. State Elec. & Gas Corp. Group (Assoc. G. & E. System)	54	(a)	74,500	(a)	38,000	412,760,797		47,000	(a)	89,500	(a)				
55	Louisville Gas & Electric Company (Del.) Subsidiaries	55		.....		.....	410,323,910		45,700		.....		.....			
56	Indiana & Michigan Electric Company	56		110,500		87,620	408,462,952		46,600		126,160					
57	Assoc. Gas & Elec. System (South Carolina Group) (*h*)	57	(a)	117,700	(a)	117,700	397,764,719		45,250	(a)	123,900	(a)				
58	Ohio Public Service Company	58	(a)	90,300	(a)	56,200	395,239,555		45,000	(a)	103,200	(a)				
59	Idaho Power Company	59	(a)	74,916	(a)	65,700	391,999,391		44,650	(a)	68,857	(a)				
60	Toledo Edison Company	60	(a)	95,400	(a)	81,000	389,779,858		44,350	(a)	107,030	(a)				
61	Northern Indiana Public Service Company	61		72,600		70,000	373,324,371		42,500		76,650		.....			
62	Assoc. Gas & Elec. System (West. Penna. Group) (*i*)	62	(a)	74,820	(a)	73,800	370,582,826		42,150	(a)	84,300	(a)				
63	Central Maine Power Company System	63	(a)	85,750		.....	361,974,791		41,200	(a)	88,070		.....			
64	Westchester Lighting Company	64		56,240		.....	360,023,800		41,000		58,328					
65	Los Angeles Gas & Electric Corporation	65		104,700		104,700	340,886,410		38,800		115,900					
66	Rochester Gas & Elec. Corp. Group (Assoc. G. & E. System)	66	(a)	68,378	(a)	60,241	336,846,546		38,350	(a)	72,727	(a)				
67	Minnesota Power & Light Company	67	(a)	70,735	(a)	70,735	336,451,669		38,300	(a)	86,870	(a)				
68	City of Seattle, Dept. of Lighting	68		87,500		87,500	334,605,000		38,100		90,000					
69	Montaup Electric Company	69		91,600		77,920	333,403,000		37,960		89,800					
70	Central Hudson Gas & Electric Corporation	70		82,200	(*d*)	34,200	324,958,106		37,000		53,500		.....			
71	Central Illinois Public Service Company	71		86,000		.....	320,293,529		36,460		83,000		.....			
72	The Yonkers Electric Light & Power Company	72		16,995		.....	318,059,700		36,220	(b)	17,271					
73	Nebraska Power Company	73	(a)	63,400	(a)	63,400	313,610,700		35,680	(a)	70,600	(a)				
74	Indianapolis Power & Light Company	74		.....		.....	302,836,096		34,500		76,500					
75	Arkansas Power & Light Company	75		63,000		25,000	301,055,000		34,280		62,500					
76	New Orleans Public Service Inc.	76		70,000		63,500	297,521,000		33,900		74,000					
77	The Nevada-California Electric Corporation System (*B*)	77		56,900		54,700	295,604,426		33,620		48,900					
78	Public Service Company of Colorado	78	(a)	66,562		.....	293,178,934		33,400	(a)	71,783	(a)				
79	U. S. Government (Muscle Shoals)	79		128,000		136,000	286,638,000		32,650		161,634					
80	Northwestern Electric Company	80	(a)	55,150	(a)	37,100	284,388,516		32,400	(a)	54,440	(a)				
81	The Hartford Electric Light Company	81		70,500		67,000	281,846,464		32,060	(a)	80,000	(a)				
82	Wisconsin Power & Light Company	82		64,850		61,000	271,008,229		30,860		66,380					
83	The Columbus Railway, Power & Light Company	83	(a)	55,000	(a)	55,000	261,830,100		29,800	(a)	61,000	(a)				
84	Long Island Lighting Company System	84		76,000		76,000	258,926,233		29,500		70,500					
85	Kentucky Utilities Company	85		60,800		55,800	251,322,584		28,600		56,000					
86	The United Illuminating Company	86		.....		.....	250,832,000		28,590		.....		.....			
87	The Scranton Electric Company	87		51,200		51,200	242,866,592		27,650		51,400					
88	Kansas Gas & Electric Company	88		49,000		49,000	235,850,500		26,860		50,600					
89	Gulf States Utilities Company	89		44,958		38,410	223,004,239		25,400		47,810					
90	Central Power & Light Company	90		33,095		30,000	220,637,696		25,140		48,025					
91	City of Tacoma, Dept. of Public Utilities	91		51,000		63,000	219,414,450		24,970		55,000					
92	Virginia Public Service Company	92		49,400		47,700	219,240,422		24,930		53,115					
93	Penn Central Light & Power Company	93		.....		47,800	212,223,069		24,180		.....					
94	Dallas Power & Light Company	94	(a)	49,300	(a)	49,000	209,154,642		23,800	(a)	52,300	(a)				
95	Illinois Electric Power Company	95	(a)	47,820	(a)	47,820	203,869,548		23,200		49,500		.....			
96	Pacific Power & Light Company	96		57,705		15,850	199,201,401		22,680		41,250					
97	Jersey Central Power & Light Company	97		52,200		61,500	198,850,022		22,650		58,000					
98	Birmingham Electric Company	98		41,196		.....	198,282,094		22,580		48,363					
99	Florida Power & Light Company	99		59,180		57,930	197,622,270		22,500		65,260					
100	Southwestern Gas & Electric Company	100		32,400		28,000	194,055,928		22,080		.....					
101	Atlantic City Electric Company	101		49,500		49,500	192,354,557		21,920		52,900					
102	Salt River Valley Water Users' Association	102		43,075		43,075	191,951,640		21,860		.....					
103	City of Detroit, Public Lighting Commission	103		52,000		46,500	190,060,990		21,630		.....					
104	Public Service Company of Oklahoma	104		39,030		34,300	186,934,051		21,280		42,500					
105	West Texas Utilities Company	105		47,660		.....	186,102,888		21,200		42,915		.....			
106	Public Service Company of New Hampshire	106	(a)	47,705	(a)	46,705	184,063,033		20,980	(a)	43,700	(a)				
107	San Diego Consolidated Gas & Electric Company	107		44,700		44,700	182,035,810		20,730		48,300					
108	Blackstone Valley Gas & Electric Company	108	(a)	47,628	(a)	18,000	179,572,365		20,450	(a)	46,187	(a)				
109	Des Moines Electric Light Company	109		40,000		40,000	177,656,470		20,230		42,000					
110	San Antonio Public Service Company	110		42,300		34,900	172,707,153		19,670		41,700					
111	Memphis Power & Light Company	111		40,500		40,500	172,532,740		19,650	(a)	44,700	(a)				
112	City of Cleveland, Dept. of Public Utilities	112		36,500		36,500	165,392,410		18,850		37,000					
113	Wisconsin Public Service Corporation and Subsidiary	113	(a)	44,600	(a)	44,600	161,601,100		18,410	(a)	44,600		.....			
114	Empire District Electric Company	114	(a)	33,100	(a)	33,100	155,431,973		17,710	(a)	37,100	(a)				
115	New Bedford Gas & Edison Light Company	115	(a)	44,200	(a)	44,200	153,982,440		17,530	(a)	51,200	(a)				
116	Sioux City Gas & Electric Co., Iowa Pub. Serv. Co. System	116		34,428		25,858	153,647,061		17,500		39,311		.....			
117	The Kansas Power & Light Company	117		.....		33,100	147,425,196		16,790		29,650		.....			
118	Cumberland County Power & Light Company	118		39,100		26,800	142,240,346		16,200		39,815					
119	The Connecticut Power Company	119		25,700		14,300	139,285,039		15,870		43,452					
120	Interstate Power Company (Del.) and Subsidiaries	120		.....		.....	137,742,749		15,690		40,403					
121	Pennsylvania Power Company	121		34,000		.....	132,689,604		15,110		39,000					
122	Mississippi Power & Light Company	122		30,372		.....	132,226,989		15,070		32,074		.....			
123	Central Illinois Light Company	123	(a)	32,791		.....	131,320,248		14,970		35,000					
124	Northern Indiana Power Company*(*L*)	124		36,300		.....	130,816,594		14,910		90,750					
125	Tampa Electric Company	125		28,200		28,200	127,731,492		14,540		27,840					
126	Indiana General Service Company	126		28,200		20,500	126,841,303		14,450		29,640					
127	Iowa Electric Light & Power Company*	127		31,225		31,225	125,997,054		14,350		32,000					
128	Luzerne County Gas & Electric Corporation	128		26,710		39,000	124,824,746		14,220	(a)	25,130	(a)				
129	Indiana Service Corporation	129		31,370		19,000	123,467,451		14,070		35,739					
130	Delaware Power & Light Company	130		26,931		.....	119,849,982		13,660		28,119					
131	Staten Island Edison Corporation	131	(a)	30,600	(a)	30,600	116,497,340		13,280	(a)	31,700	(a)				
132	Moline-Rock Island Manufacturing Company	132		28,820		26,000	116,424,946		13,270		33,590					
133	The United Power & Light Corporation (of Kansas)	133		24,500		.....	114,104,546		13,000		26,000		.....			
134	Ohio Electric Power Company Group	134		.....		.....	110,185,257		12,540		.....		.....			
135	Western United Gas & Electric Company	135		24,500		25,200	109,398,945		12,460		.....		.....			

3,710	67,160	493,678,000	56,200		119,390		100,500	650,549,000		74,300	135,405			746,475,000		85,200
4,700	81,795	471,471,767	53,700		92,425		81,760	465,156,805		53,100	83,540			476,173,234		54,300

60,500	106,190	.....	358,754,000	(*m*)	91,500	451,000,000	98,210	550,000,000	.....	.....	57	
20,400	55,000	53,200	162,129,679		54,800	148,932,217	.....	.....	.....	.....		

100,500	650,549,000	74,300	135,405	.....	746,475,000	85,200	.....	142,505	882,360,000	(*m*) 132,390		830
81,760	465,156,805	53,100	83,540	.....	476,173,234	54,300	94,575	.....	410,083,711	.....		441
.....	506,145,010	57,800	.....	102,050	533,762,511	60,900	.....	108,300	542,629,220	105,000		491
82,720	521,669,355	59,500	73,933	71,780	568,018,000	64,800	.....	.....	665,625,000	(*m*) 67,494		381
93,100	524,913,000	59,900	107,235	103,900	566,409,000	64,700	.....	96,205	510,247,000	(*m*) 82,600		436
89,890	445,325,000	50,800	101,000	98,405	440,721,000	50,300	.....	102,780	442,818,000	.....		374
85,100	443,000,000	50,500	93,100	93,100	476,000,000	54,300	.....	105,100	494,805,982	.....		.....
95,530	489,174,640	55,800	117,320	114,500	643,486,718	73,450	.....	.....	692,070,936	.....		567
33,500	430,009,374	49,100	.....	.....	444,904,828	50,800	.....	.....	377,746,958	.....		.....
.....	450,407,520	51,400	91,235	.....	348,598,452	39,800	.....	.....	328,598,520	.....		285
95,620	491,439,695	56,100	120,860	.....	530,316,000	60,500	106,190	.....	538,734,000	(*m*) 91,560		454
123,900	425,907,556	48,600	68,000	65,100	178,976,937	20,400	55,000	53,200	162,129,679	54,800		148
71,000	455,840,667	52,000	.....	118,300	553,277,582	63,100	.....	114,900	611,482,217	111,800		559
66,440	450,864,575	51,500	.....	70,130	482,065,456	55,000	.....	71,114	471,732,000	(*m*) 72,080		506
95,000	452,178,712	51,600	.....	123,230	468,679,050	53,400	.....	123,700	514,989,108	100,020		458
.....	423,230,408	48,300	.....	68,740	370,866,979	42,300	.....	66,928	334,913,629	52,094		302
84,000	411,565,334	46,900	.....	.....	.....	.....	.....	.....	.....	.....		.....
.....	440,667,827	50,300	.....	69,200	295,981,170	33,790	.....	53,045	270,606,693	53,200		240
0	357,430,320	40,800	56,580	56,482	283,625,262	32,300	50,600	50,200	216,503,601	45,150		171
115,900	429,006,384	48,970	115,000	115,000	388,312,942	44,300	90,000	90,000	304,100,629	81,500		269
71,227	366,281,440	41,800	86,926	78,008	387,454,655	44,200	91,523	83,023	393,506,327	75,290		376
86,870	391,586,638	44,700	.....	95,823	456,913,135	52,150	.....	87,736	427,848,189	(*m*) 80,696		416
90,000	353,764,500	40,400	89,500	89,000	384,812,680	43,480	90,000	80,000	364,959,930	75,000		307
77,940	435,364,000	49,700	96,000	90,200	374,034,000	42,700	112,000	101,000	338,215,600	.....		.....
.....	221,840,852	25,300	53,000	50,000	195,689,541	22,300	56,500	55,400	200,566,867	53,000		213
.....	342,162,436	39,100	.....	87,500	366,474,373	41,800	.....	86,300	367,912,947	66,300		339
0	317,666,263	36,300	(See the N. Y. Edison & Allied Cos.)									
70,600	345,568,500	39,400	68,000	65,000	320,411,600	36,500	.....	55,000	265,901,500	(*m*) 47,000		219
61,900	344,025,888	39,300	.....	78,600	374,997,370	42,800	.....	82,800	388,871,320	76,600		350
28,300	304,690,000	34,800	67,000	66,100	331,538,000	37,800	.....	.....	310,955,000	.....		259
74,000	341,034,400	38,900	71,500	70,100	350,484,000	40,000	.....	68,000	345,847,000	(*m*) 68,000		338
41,800	275,500,157	31,450	.....	51,400	292,135,954	33,300	.....	55,800	300,320,585	51,900		294
71,783	318,427,572	36,350	.....	73,682	331,467,254	37,800	.....	72,453	319,607,394	(*m*) 67,797		298
162,034	345,603,400	39,400	148,000	145,092	306,119,200	34,900	116,260	112,500	171,681,600	120,600		222
50,400	287,290,707	32,800	.....	54,160	278,947,541	31,800	.....	56,000	286,529,056	(*m*) 53,100		286
83,000	368,970,842	42,200	.....	59,800	396,238,000	45,200	.....	55,900	362,855,320	52,500		242
61,480	284,597,748	32,500	68,000	67,600	292,252,317	33,300	61,000	60,784	296,527,833	.....		281
61,000	270,864,584	30,900	.....	71,000	294,445,800	33,600	70,000	70,000	315,558,310	60,000		283
70,500	244,156,063	27,850	65,300	64,900	222,301,296	25,375	58,200	48,000	197,097,106	50,000		177
50,500	249,540,548	28,500	68,570	68,570	252,292,869	28,800	60,000	.....	240,724,354	39,910		194
.....	278,062,000	31,800	36,500	.....	283,365,700	32,300	76,500	.....	288,417,200	(*m*) 34,500		272
51,400	263,811,192	30,100	55,500	.....	279,155,000	31,860	58,200	.....	240,508,000	(*m*) 52,400		244
50,600	251,304,100	28,700	54,500	52,500	271,396,600	30,980	.....	62,400	284,354,000	(*m*) 49,900		249
36,000	266,182,789	30,400	54,567	52,000	293,365,397	33,500	48,998	47,000	273,182,834	35,204		193
43,125	249,425,222	28,500	55,270	55,270	276,668,160	31,500	42,800	.....	239,756,655	34,845		144
66,000	253,913,000	29,000	55,000	53,000	254,074,415	29,000	55,000	54,300	255,771,531	49,000		201
55,680	220,893,275	25,200	47,500	44,400	193,392,263	22,100	.....	.....	.....	.....		.....
47,500	234,162,059	26,700	50,300	50,100	243,323,574	27,700	51,550	50,300	237,817,248	45,800		211
52,000	220,291,750	25,100	56,000	53,000	215,889,590	24,600	.....	55,400	199,099,200	(*m*) 46,400		171
.....	272,384,736	31,100	51,600	50,000	268,900, 23	30,700	56,650	55,000	246,321,037	53,000		224
18,325	230,487,553	26,300	.....	42,775	220,440,374	25,100	.....	.....	251,759,000	.....		232
54,000	192,586,692	22,000	42,500	40,000	144,902,031	16,500	.....	.....	.....	.....		.....
0	252,222,842	28,800	52,820	52,464	277,437,821	31,700	.....	54,820	292,759,162	(*m*) 53,720		291
64,880	208,124,600	23,750	.....	67,940	207,310,965	23,600	.....	59,208	202,110,030	(*m*) 60,708		195
30,300	196,644,219	22,400	.....	.....	163,474,091	18,650	.....	.....	149,696,794	31,790		119
52,900	213,819,894	24,400	50,000	.....	201,758,000	22,900	48,000	.....	184,172,000	(*m*) 41,500		143
63,160	292,324,270	33,400	53,370	.....	276,816,917	31,400	46,315	.....	188,665,617	(*m*) 55,200		272
45,000	217,010,380	24,750	47,000	44,700	206,514,320	23,500	47,000	44,000	190,900,800	.....		.....
37,000	200,698,570	22,900	54,200	52,800	268,724,289	30,700	47,000	.....	255,220,126	46,000		224
.....	203,968,162	23,300	.....	41,140	231,817,948	26,400	41,000	39,000	246,515,315	44,220		142
42,675	181,949,548	20,750	40,000	39,700	157,222,444	17,900	.....	.....	.....	.....		.....
48,300	198,800,090	22,650	47,200	47,000	179,709,699	20,500	45,300	.....	185,639,011	.....		154
6,000	192,089,421	21,950	.....	49,815	183,442,323	20,900	.....	55,515	207,701,144	54,970		184
42,000	185,041,631	21,100	.....	42,500	183,658,907	20,950	.....	42,500	172,539,101	36,000		153
36,500	199,783,901	22,800	54,500	.....	238,979,012	27,280	53,400	51,600	238,200,935	.....		.....
44,700	189,341,440	21,600	49,000	48,000	195,429,828	22,300	.....	45,000	182,112,000	(*m*) 41,261		172
37,000	179,870,560	20,500	.....	38,000	189,781,760	21,650	38,300	.....	198,179,340	(*m*) 37,200		184
.....	185,877,236	21,200	.....	48,300	205,587,325	23,400	50,400	.....	176,194,115	.....		142
37,100	178,540,162	20,380	.....	49,600	224,158,905	25,600	.....	60,600	258,682,003	(*m*) 55,500		224
51,200	190,585,830	21,700	54,100	53,000	195,293,900	22,300	58,800	58,000	219,020,744	56,000		164
.....	171,071,489	19,530	.....	42,500	175,304,555	19,950	42,400	40,500	162,477,080	.....		.....
.....	143,502,741	16,380	.....	28,700	142,385,334	16,250	.....	27,800	122,992,015	30,750		102
18,815	149,093,897	17,020	43,600	43,220	143,380,401	16,350	41,510	41,940	144,364,260	30,200		112
11,140	132,960,016	15,180	.....	24,755	139,618,715	15,940	.....	.....	.....	.....		.....
33,480	141,315,424	16,130	.....	.....	142,532,297	16,250	.....	.....	.....	.....		.....
0	178,076,358	20,300	.....	45,000	232,425,592	26,490	.....	.....	.....	.....		.....
.....	146,433,090	16,700	.....	31,000	138,781,877	15,840	.....	25,508	103,748,759	.....		.....
0	151,421,136	17,300	38,200	37,500	171,834,023	19,600	40,900	39,400	177,338,443	(*K*)		154
68,100	448,574,681	51,200	.....	99,070	441,309,468	50,300	.....	93,170	424,300,963	84,205		387
24,600	143,522,953	16,380	35,630	.....	178,992,370	20,400	.....	33,000	170,887,397	(*m*) 31,720		154
2,840	147,896,790	16,880	31,390	.....	146,368,000	16,700	23,620	.....	145,405,000	(*m*) 26,480		122
32,000	134,821,422	15,390	.....	.....	.....	.....	.....	.....	.....	.....		.....
41,750	123,216,441	14,080	41,000	40,000	129,087,117	14,700	29,610	26,810	115,530,335	.....		.....
21,000	157,710,391	18,000	.....	37,400	178,538,313	20,380	41,000	.....	180,016,985	40,000		154
0	136,633,985	15,600	28,700	27,880	137,457,239	15,700	31,200	29,700	134,571,700	23,500		122
31,700	128,454,330	14,660	36,000	31,500	142,486,580	16,250	37,000	31,800	128,665,860	28,100		112
29,000	130,452,095	14,900	41,380	40,000	157,500,686	17,990	40,480	40,000	164,206,522	34,750		153
.....	127,308,532	14,530	.....	27,150	127,822,014	14,590	.....	23,230	103,802,181	.....		.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....

200	.....	142,505	882,360,000	(*m*) 132,390	830,862,000	118,678	784,402,000	120,270	801,444,000	46		
300	94,575	.....	410,083,711	.....	441,845,615	.....	374,724,290	67,040	293,010,721	47		

131	Staten Island Edison Corporation	131	(o)	30,600	(o)	30,600	116,497,340		13,280	(o)	31,700	(o)							
132	Moline-Rock Island Manufacturing Company	132		28,820		26,000	116,424,946		13,270		33,590								
133	The United Power & Light Corporation (of Kansas)	133		24,500			114,104,546		13,000		26,000								
134	Ohio Electric Power Company Group	134					110,185,257		12,540										
135	Western United Gas & Electric Company	135		24,500		25,200	109,398,945		12,460										

3,710		67,160	493,678,000	56,200		119,390		100,500	650,549,000		74,300		135,405			746,475,000		85,200	
4,700		81,795	471,471,767	53,700		92,425		81,760	465,156,805		53,100		83,540			476,173,234		54,300	
9,000			458,872,819	52,260		99,000			506,145,010		57,800				102,050	533,762,511		60,900	
3,622	(o)	82,152	457,534,000	51,550	(o)	86,190	(o)	82,720	521,669,355		59,500		73,933		71,780	568,018,000		64,800	
2,600	(o)	79,500	435,971,000	49,600	(o)	96,210	(o)	93,100	524,913,000		59,900		107,235		103,900	566,409,000		64,700	
2,540	(o)	82,630	435,440,000	49,550	(o)	105,225	(o)	89,890	445,325,000		50,800		101,000		98,405	440,721,000		50,300	
6,700			433,146,000	49,300		86,100		85,100	443,000,000		50,500		93,100		93,100	476,000,000		54,300	
3,152			430,351,857	49,000		99,494		95,530	489,174,640		55,800		117,320		114,500	643,486,718		73,450	
4,500	(o)	38,000	412,760,797	47,000	(o)	89,500	(o)	33,500	430,009,374		49,100					444,904,828		50,800	
			410,323,910	45,700					450,407,520		51,400		91,235			348,598,452		39,800	
0,500		87,620	408,462,952	46,600		126,160		95,620	491,439,695		56,100		120,860			530,316,000		60,500	
7,700	(o)	117,700	397,764,719	45,250	(o)	123,900	(o)	123,900	425,907,556		48,600		68,000		65,100	178,976,937		20,400	
0,300	(o)	56,200	395,239,555	45,000	(o)	103,200	(o)	71,000	455,840,667		52,000				118,300	553,277,582		63,100	
4,916	(o)	65,700	391,999,391	44,650	(o)	68,857	(o)	66,440	450,864,575		51,500				70,130	482,065,456		55,000	
5,400	(o)	81,000	389,779,858	44,350	(o)	107,030	(o)	95,000	452,178,712		51,600				123,230	468,679,050		53,400	
2,600		70,000	373,324,371	42,500		76,650			423,230,408		48,300				68,740	370,866,979		42,300	
4,820	(o)	73,800	370,582,826	42,150	(o)	84,300	(o)	84,000	411,565,334		46,900								
5,750			361,974,791	41,200	(o)	88,070			440,667,827		50,300				69,200	295,981,170		33,790	
6,240			360,023,800	41,000		58,328		0	357,430,320		40,800		56,580		56,482	283,625,262		32,300	
4,700		104,700	340,886,410	38,800		115,900		115,900	429,006,384		48,970		115,000		115,000	388,312,942		44,300	
8,378	(o)	60,241	336,846,546	38,350	(o)	72,727	(o)	71,227	366,281,440		41,800		86,926		78,008	387,454,655		44,200	
0,735	(o)	70,735	336,451,669	38,300	(o)	86,870	(o)	86,870	391,586,638		44,700				95,823	456,913,135		52,150	
7,500		87,500	334,605,000	38,100		90,000		90,000	353,764,500		40,400		89,500		89,000	384,812,680		43,480	
1,600		77,920	333,403,000	37,960		89,800		77,940	435,364,000		49,700		96,000		90,200	374,034,000		42,700	
2,200	(d)	34,200	324,958,106	37,000		53,500			221,840,852		25,300		53,000		50,000	195,689,541		22,300	
6,000			320,293,529	36,460		83,000			342,162,436		39,100				87,500	366,474,373		41,800	
6,995			318,059,700	36,220	(b)	17,271		0	317,666,263		36,300		(See the N. Y. Edison & Allied Cos.)						
3,400	(o)	63,400	313,610,700	35,680	(o)	70,600	(o)	70,600	345,568,500		39,400		68,000		65,000	320,411,600		36,500	
			302,836,096	34,500		76,500		61,900	344,025,888		39,300				78,600	374,997,370		42,800	
3,000		25,000	301,055,000	34,280		62,500		28,300	304,690,000		34,800		67,000		66,100	331,538,000		37,800	
0,000		63,500	297,521,000	33,900		74,000		74,000	341,034,400		38,900		71,500		70,100	350,484,000		40,000	
6,900		54,700	295,604,426	33,620		48,900		41,800	275,500,157		31,450				51,400	292,135,954		33,300	
6,562			293,178,934	33,400	(o)	71,783	(o)	71,783	318,427,572		36,350				73,682	331,467,254		37,800	
8,000		136,000	286,638,000	32,650		161,634		162,034	345,603,400		39,400		148,000		145,092	306,119,200		34,900	
5,150	(o)	37,100	284,388,516	32,400	(o)	54,440	(o)	50,400	287,290,707		32,800				54,160	278,947,541		31,800	
0,500		67,000	281,846,464	32,060	(o)	80,000	(o)	83,000	368,970,842		42,200				59,800	396,238,000		45,200	
4,850		61,000	271,008,229	30,860		66,380		61,480	284,597,748		32,500		68,000		67,600	292,252,317		33,300	
5,000	(o)	55,000	261,830,100	29,800	(o)	61,000	(o)	61,000	270,864,584		30,900				71,000	294,445,800		33,600	
6,000		76,000	258,926,233	29,500		70,500		70,500	244,156,063		27,850		65,300		64,900	222,301,296		25,375	
0,800		55,800	251,322,584	28,600		56,000		50,500	249,540,548		28,500		68,570		68,570	252,292,869		28,800	
			250,832,000	28,590					278,062,000		31,800		36,500			283,365,700		32,300	
1,200		51,200	242,866,592	27,650		51,400		51,400	263,811,192		30,100		55,500			279,155,000		31,860	
9,000		49,000	235,850,500	26,860		50,600		50,600	251,304,100		28,700		54,500		52,500	271,396,600		30,980	
4,958		38,410	223,004,239	25,400		47,810		36,000	266,182,789		30,400		54,567		52,000	293,365,397		33,500	
3,095		30,000	220,637,696	25,140		48,025		43,125	249,425,222		28,500		55,270		55,270	276,668,160		31,500	
1,000		63,000	219,414,450	24,970		55,000		66,000	253,913,000		29,000		55,000		53,000	254,074,415		29,000	
9,400		47,700	219,240,422	24,930		53,115		55,680	220,893,275		25,200		47,500		44,400	193,392,263		22,100	
		47,800	212,223,069	24,180				47,500	234,162,059		26,700		50,300		50,100	243,323,574		27,700	
9,300	(o)	49,000	209,154,642	23,800	(o)	52,300	(o)	52,000	220,291,750		25,100		56,000		53,000	215,889,590		24,600	
7,820	(o)	47,820	203,869,548	23,200		49,500			272,384,736		31,100		51,600		50,000	268,900, 23		30,700	
7,705		15,850	199,201,401	22,680		41,250		18,325	230,487,553		26,300				42,775	220,440,374		25,100	
2,200		61,500	198,850,022	22,650		58,000		54,000	192,586,692		22,000		42,500		40,000	144,902,031		16,500	
1,196			198,282,094	22,580		48,363		0	252,222,842		28,800		52,820		52,464	277,437,821		31,700	
9,180		57,930	197,622,270	22,500		65,260		64,880	208,124,600		23,750				67,940	207,310,965		23,600	
2,400		28,000	194,055,928	22,080				30,300	196,644,219		22,400					163,474,091		18,650	
9,500		49,500	192,354,557	21,920		52,900		52,900	213,819,894		24,400		50,000			201,758,000		22,900	
3,075		43,075	191,951,640	21,860				63,160	292,324,270		33,400		53,370			276,816,917		31,400	
2,000		46,500	190,060,990	21,630				45,000	217,010,380		24,750		47,000		44,700	206,514,320		23,500	
9,030		34,300	186,934,051	21,280		42,500		37,000	200,698,570		22,900		54,200		52,800	268,724,289		30,700	
7,660			186,102,888	21,200		42,915			203,968,162		23,300				41,140	231,817,948		26,400	
7,705	(o)	46,705	184,063,033	20,980	(o)	43,700	(o)	42,675	181,949,548		20,750		40,000		39,700	157,222,444		17,900	
4,700		44,700	182,035,810	20,730		48,300		48,300	198,800,090		22,650		47,200		47,000	179,709,699		20,500	
7,628	(o)	18,000	179,572,365	20,450	(o)	46,187	(o)	6,000	192,089,421		21,950				49,815	183,442,323		20,900	
0,000		40,000	177,656,470	20,230		42,000		42,000	185,041,631		21,100				42,500	183,658,907		20,950	
2,300		34,900	172,707,153	19,670		41,700		36,500	199,783,901		22,800		54,500			238,979,012		27,280	
0,500		40,500	172,532,740	19,650	(o)	44,700	(o)	44,700	189,341,440		21,600		49,000		48,000	195,429,828		22,300	
6,500		36,500	165,392,410	18,850		37,000		37,000	179,870,560		20,500				38,000	189,781,760		21,650	
4,600	(o)	44,600	161,601,100	18,410	(o)	44,600			185,877,236		21,200				48,300	205,587,325		23,400	
3,100	(o)	33,100	155,431,973	17,710	(o)	37,100	(o)	37,100	178,540,162		20,380				49,600	224,158,905		25,600	
4,200	(o)	44,200	153,982,440	17,530	(o)	51,200	(o)	51,200	190,585,830		21,700		54,100		53,000	195,293,900		22,300	
4,428		25,858	153,647,061	17,500		39,311			171,071,489		19,530				42,500	175,304,555		19,950	
		33,100	147,425,196	16,790		29,650			143,502,741		16,380				28,700	142,385,334		16,250	
9,100		26,800	142,240,346	16,200		39,815		18,815	149,093,897		17,020		43,600		43,220	143,380,401		16,350	
5,700		14,300	139,285,039	15,870		43,452		11,140	132,960,016		15,180				24,755	139,618,715		15,940	
			137,742,749	15,690		40,403		33,480	141,315,424		16,130					142,532,297		16,250	
4,000			132,689,604	15,110		39,000		0	178,076,358		20,300				45,000	232,425,592		26,490	
0,372			132,226,989	15,070		32,074			146,433,090		16,700				31,000	138,781,877		15,840	
2,791			131,320,248	14,970		35,000		0	151,421,136		17,300		38,200		37,500	171,834,023		19,600	
6,300			130,816,594	14,910		90,750		68,100	448,574,681		51,200				99,070	441,309,468		50,300	
8,200		28,200	127,731,492	14,540		27,840		24,600	143,522,953		16,380		35,630			178,992,370		20,400	
8,200		20,500	126,841,303	14,450		29,640		2,840	147,896,790		16,880		31,390			146,368,000		16,700	
1,225		31,225	125,997,054	14,350		32,000		32,000	134,821,422		15,390								
6,710		39,000	124,824,746	14,220	(o)	25,130	(o)	41,750	123,216,441		14,080		41,000		40,000	129,087,117		14,700	
1,370		19,000	123,467,451	14,070		35,739		21,000	157,710,391		18,000				37,400	178,538,313		20,380	
6,931			119,849,982	13,660		28,119		0	136,633,985		15,600		28,700		27,880	137,457,239		15,700	
0,600	(o)	30,600	116,497,340	13,280	(o)	31,700	(o)	31,700	128,454,330		14,660		36,000		31,500	142,486,580		16,250	
8,820		26,000	116,424,946	13,270		33,590		29,000	130,452,095		14,900		41,380		40,000	157,500,686		17,990	
24				13,000		26,000			127,398,532		14,530				27,150	127,822,014		14,590	

111	Memphis Power & Light Company	111		40,500		40,500	172,532,740		19,050	(o)	44,700	(o)							
112	City of Cleveland, Dept. of Public Utilities	112		36,500		36,500	165,392,410		18,850		37,000								
113	Wisconsin Public Service Corporation and Subsidiary	113	(o)	44,600	(o)	44,600	161,601,100		18,410	(o)	44,600								
114	Empire District Electric Company	114	(o)	33,100	(o)	33,100	155,431,973		17,710	(o)	37,100	(o)							

29,000	130,452,095	14,900	41,380	40,000	157,500,686	17,990	40,480	40,000	164,206,522	34,750	13
.....	127,308,532	14,530	.....	27,150	127,822,014	14,590	.....	23,230	103,802,181	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

,200	.....	142,505	882,360,000	(m)	132,390	830,862,000	118,678	784,402,000	120,270	801,444,000	46
,300	94,575	.....	410,083,711	.....		441,845,615	.....	374,724,290	67,040	293,010,721	47
,900	.....	108,300	542,629,220		105,000	491,171,956	.....	.....	.....	.....	48
,800	.....	.....	665,625,000	(m)	67,494	381,404,000	.....	241,723,000	.....	.....	49
,700	.....	96,205	510,247,000	(m)	82,600	436,633,000	75,000	362,094,000	56,000	263,299,360	50
,300	.....	102,780	442,818,000	.....		374,563,000	84,200	355,707,000	76,300	339,468,000	51
,300	.....	105,100	494,805,982	.....		.....	.....	.....	.....	.....	52
,450	.....	.....	692,070,936	.....		567,869,411	.....	399,543,412	54,942	207,140,920	53
,800	.....	.....	377,746,958	.....		.....	.....	.....	.....	.....	54
,800	.....	.....	328,598,520	.....		285,767,900	.....	234,238,160	.....	222,310,255	55
,500	106,190	.....	538,734,000	(m)	91,560	454,600,000	90,110	390,808,000	91,490	318,395,010	56
,400	55,000	53,200	162,129,679		54,800	148,932,217	.....	.....	.....	.....	57
,100	.....	114,900	611,482,217		111,800	559,090,541	(o) 98,700	495,593,161	(o) 107,400	535,078,389	58
,000	.....	71,114	471,732,000	(m)	72,080	506,009,000	70,245	352,253,000	47,990	266,320,000	59
,400	.....	123,700	514,989,108		100,020	458,973,651	(o) 81,400	382,228,176	77,400	350,695,351	60
,300	.....	66,928	334,913,629		52,094	302,031,809	(n) 44,990	271,440,543	(n) 44,750	227,490,211	61
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	62
,790	.....	53,045	270,606,693		53,200	240,169,182	(o) 48,600	220,727,440	(o) 43,800	183,268,485	63
,300	50,600	50,200	216,503,601		45,150	171,315,819	(See the N. Y. Edison & Allied Cos.)		32,980	126,197,021	64
,300	90,000	90,000	304,100,629		81,500	269,681,600	74,000	247,191,413	68,200	213,459,806	65
,200	91,523	83,023	393,506,327		75,290	376,764,523	80,150	352,809,582	77,680	326,148,706	66
,150	.....	87,736	427,848,189	(m)	80,696	416,134,000	77,950	401,856,000	86,410	399,825,337	67
,480	90,000	80,000	364,959,930		75,000	307,909,700	75,000	277,591,025	64,800	232,848,275	68
,700	112,000	101,000	338,215,600	.....		.....	.....	.....	.....	.....	69
,300	56,500	55,400	200,566,867		53,000	213,612,676	(o) 52.900	222,368,156	.....	.....	70
,800	.....	86,300	367,912,947		66,300	339,189,800	(n) 72,600	301,548,168	(n) 74,600	278,626,089	71
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	72
,500	.....	55,000	265,901,500	(m)	47,000	219,813,000	41,900	201,094,000	38,800	187,052,800	73
,800	.....	82,800	388,871,320		76,600	356,228,046	(n) 63,500	328,712,384	.....	.....	74
,800	.....	.....	310,955,000	.....		259,164,000	.....	183,843,000	43,500	151,908,790	75
,000	.....	68,000	345,847,000	(m)	68,000	338,629,000	66,500	319,842,000	66,000	222,927,000	76
,300	.....	55,800	300,320,585		51,900	294,781,380	57,600	279,334,470	50,200	273,230,332	77
,800	.....	72,453	319,607,394	(m)	67,797	298,387,145	(o) 63,980	285,892,553	67,080	268,618,910	78
,900	116,260	112,500	171,681,600		120,600	222,096,800	125,540	565,609,500	106,400	439,380,300	79
,800	.....	56,000	286,529,056	(m)	53,100	286,820,000	48,100	255,766,000	44,400	237,403,000	80
,200	.....	55,900	362,855,320		52,500	242,563,000	(n, G) 51,300	220,324,000	67,000	192,253,000	81
,300	61,000	60,784	296,527,833	.....		283,520,629	.....	275,376,599	62,000	258,765,399	82
,600	70,000	70,000	315,558,310		60,000	283,654,155	(n) 55,100	254,843,000	.....	.....	83
,375	58,200	48,000	197,097,106		50,000	172,923,000	49,000	135,372,000	38,000	108,600,000	84
,800	60,000	.....	240,724,354		39,910	194,822,819	45,800	185,904,592	34,100	146,560,259	85
,300	76,500	.....	288,417,200	(m)	34,500	275,965,650	.....	222,132,700	(k) 31,000	(k) 115,535,700	86
,860	58,200	.....	240,508,000	(m)	52,400	245,526,000	51,000	237,512,000	54,020	214,065,156	87
,980	.....	62,400	284,354,000	(m)	49,900	249,717,000	44,600	221,118,000	44,400	194,417,500	88
,500	48,998	47,000	273,182,834		35,204	191,081,273	29,754	155,783,691	(l) 22,000	100,344,073	89
,500	42,800	.....	239,756,655		34,845	146,744,975	(n) 25,205	120,521,353	.....	.....	90
,000	55,000	54,300	255,771,531		49,000	208,399,465	61,500	197,580,149	55,000	195,791,000	91
,100	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	92
,700	51,550	50,300	237,817,248		45,800	213,808,418	(n) 45,000	226,892,235	62,500	227,630,419	93
,600	.....	55,400	199,099,200	(m)	46,400	179,165,000	44,300	171,925,970	35,100	159,430,750	94
,700	56,650	55,000	246,321,037		53,000	228,660,184	53,010	213,752,872	43,000	165,088,310	95
,100	.....	.....	251,759,000	.....		232,877,000	35,105	171,611,000	27,677	166,214,470	96
,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	97
,700	.....	54,820	292,759,162	(m)	53,720	298,379,513	53,811	289,073,000	41,692	200,750,534	98
,600	.....	59,208	202,110,030	(m)	60,708	199,322,000	65,364	214,167,000	64,000	173,623,725	99
,650	.....	.....	149,696,794		31,790	119,647,273	.....	.....	.....	.....	100
,900	48,000	.....	184,172,000	(m)	41,500	148,331,000	36,000	157,892,000	29,000	106,141,300	101
,400	46,315	.....	188,665,617	(m)	55,200	275,550,594	53,275	206,356,017	24,750	113,107,669	102
,500	47,000	44,000	190,900,800	.....		.....	.....	.....	.....	.....	103
,700	47,000	.....	255,220,126		46,000	224,426,315	39,222	135,199,859	.....	.....	104
,400	41,000	39,000	246,515,315		44,220	147,963,154	.....	.....	.....	.....	105
,900	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	106
,500	45,300	.....	185,639,011	.....		153,825,600	.....	126,801,100	31,900	123,369,160	107
,900	.....	55,515	207,701,144		54,970	182,918,142	(o) 52,200	165,318,271	(o) 51,792	153,976,958	108
,950	.....	42,500	172,539,101		36,000	159,666,072	40,000	134,416,934	32,000	128,293,150	109
,280	53,400	51,600	238,200,935	.....		.....	.....	.....	.....	.....	110
,300	.....	45,000	182,112,000	(m)	41,261	172,781,000	46,000	166,244,000	36,392	137,786,000	111
,650	38,300	.....	198,179,340	(m)	37,200	186,242,950	33,700	174,146,677	.....	164,932,820	112
,400	50,400	.....	176,194,115	.....		149,811,913	.....	153,364,676	(o) 33,200	150,635,115	113
,600	.....	60,600	258,682,003	(m)	55,500	226,034,240	(o) 61,000	262,409,515	62,280	214,669,321	114
,300	58,800	58,000	219,020,744		56,000	167,613,529	50,500	173,617,378	52,600	172,222,651	115
,950	42,400	40,500	162,477,080	.....		.....	.....	.....	.....	.....	116
,250	.....	27,800	122,992,015		30,750	108,519,670	.....	.....	.....	.....	117
,350	41,510	41,940	144,364,260		30,200	114,835,060	(n) 30,580	116,194,720	.....	107,971,800	118
,940	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	119
,250	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	120
,490	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	121
,840	.....	25,508	103,748,759	.....		.....	.....	.....	.....	.....	122
,600	40,900	39,400	177,338,443		(K)	156,467,174	31,727	135,692,265	28,600	117,679,234	123
,300	.....	93,170	424,300,963		84,205	383,337,429	74,100	305,326,889	80,070	334,518,201	124
,400	.....	33,000	170,887,397	(m)	31,720	152,885,453	25,340	114,195,401	(n) 27,620	100,462,550	125
,700	23,620	.....	145,405,000	(m)	26,480	122,579,000	24,600	105,634,000	23,140	104,648,573	126
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	127
,700	29,610	26,810	115,530,335	.....		.....	.....	.....	.....	.....	128
,380	41,000	.....	180,016,985		40,000	152,957,600	34,000	131,861,909	32,900	123,632,339	129
,700	31,200	29,700	134,571,700		23,500	122,337,055	(o) 25,000	109,786,578	22,500	111,341,210	130
,250	37,000	31,800	128,665,860		28,100	117,999,180	29,000	107,715,140	31,500	100,957,540	131
,990	40,480	40,000	164,206,522		34,750	151,902,906	31,570	131,017,494	32,530	124,713,651	132
,590	.....	23,230	103,802,181	.....		.....	.....	.....	.....	.....	133

,700	37,000	179,870,560	20,500	.....		38,000	189,781,760	21,650	.....	45,000	182,112,000	(m)	41,261	17
.....	.....	185,877,236	21,200	.....		48,300	205,587,325	23,400	38,300	.....	198,179,340	(m)	37,200	18
,000	37,100	178,540,162	20,380	.....		49,600	224,158,905	25,600	50,400	.....	176,194,115	.....		14
,700	.....	.....	.....	.....		.....	.....	.....	.....	60,600	258,682,003	(m)	55,500	22

111	Memphis Power & Light Company	111		40,500		40,500	172,532,740	19,650	(o)	44,700	(o)	44,700	
112	City of Cleveland, Dept. of Public Utilities	112		36,500		36,500	165,392,410	18,850		37,000			
113	Wisconsin Public Service Corporation and Subsidiary	113	(o)	44,600	(o)	44,600	161,601,100	18,410	(o)	44,600			
114	Empire District Electric Company	114	(o)	33,100	(o)	33,100	155,431,973	17,710	(o)	37,100	(o)		
115	New Bedford Gas & Edison Light Company	115	(o)	44,200	(o)	44,200	153,982,440	17,530	(o)	51,200	(o)		
116	Sioux City Gas & Electric Co., Iowa Pub. Serv. Co. System	116		34,428		25,858	153,647,061	17,500		39,311			
117	The Kansas Power & Light Company	117				33,100	147,425,196	16,790		29,650			
118	Cumberland County Power & Light Company	118		39,100		26,800	142,240,346	16,200		39,815			
119	The Connecticut Power Company	119		25,700		14,300	139,285,039	15,870		43,452			
120	Interstate Power Company (Del.) and Subsidiaries	120					137,742,749	15,690		40,403			
121	Pennsylvania Power Company	121		34,000			132,689,604	15,110		39,000			
122	Mississippi Power & Light Company	122		30,372			132,226,989	15,070		32,074			
123	Central Illinois Light Company	123	(o)	32,791			131,320,248	14,970		35,000			
124	Northern Indiana Power Company*(L)	124		36,300			130,816,594	14,910		90,750			
125	Tampa Electric Company	125		28,200		28,200	127,731,492	14,540		27,840			
126	Indiana General Service Company	126		28,200		20,500	126,841,303	14,450		29,640			
127	Iowa Electric Light & Power Company*	127		31,225		31,225	125,997,054	14,350		32,000			
128	Luzerne County Gas & Electric Corporation	128		26,710		39,000	124,824,746	14,220	(o)	25,130	(o)		
129	Indiana Service Corporation	129		31,370		19,000	123,467,451	14,070		35,739			
130	Delaware Power & Light Company	130		26,931			119,849,982	13,660		28,119			
131	Staten Island Edison Corporation	131	(o)	30,600	(o)	30,600	116,497,340	13,280	(o)	31,700	(o)	31,700	
132	Moline-Rock Island Manufacturing Company	132		28,820		26,000	116,424,946	13,270		33,590		29,000	
133	The United Power & Light Corporation (of Kansas)	133		24,500			114,104,546	13,000		26,000			
134	Ohio Electric Power Company Group	134					110,185,257	12,540					
135	Western United Gas & Electric Company	135		24,500		25,200	109,398,945	12,460					
136	Mountain States Power Company	136					104,430,631	11,900					
137	Wisconsin Valley Electric Company	137		27,740		14,020	103,954,670	11,840		31,360			
138	Mississippi Power Company	138		25,305		4,620	103,725,735	11,820		26,783			
139	Florida Power Corporation and Subsidiaries	139		26,700		26,700	98,446,191	11,210		25,800			
140	Tennessee Public Service Company	140		20,030		101	93,796,831	10,680		22,387			
141	Bangor Hydro-Electric Company	141	(o)	21,970	(o)	21,970	91,388,626	10,400	(o)	23,830	(o)		
142	El Paso Electric Company (and Affiliates)	142		19,900		19,900	89,443,680	10,180		24,034			
143	South Carolina Power Company	143	(o)	26,100	(o)	26,100	89,262,093	10,170		31,200			
144	Wheeling Electric Company	144		21,584			86,783,762	9,880		26,980			
	Total (C)						86,913,281,452						
	Canada												
145	Hydro-Electric Power Commission of Ontario	1		828,280		527,420	4,221,001,199	481,000		915,945			
146	The Shawinigan Water & Power Company (A)	2		618,100		474,500	3,170,358,660	361,000		540,500			
147	Canadian Hydro-Electric Corporation, Ltd. System	3		503,705		503,005	2,527,827,765	288,000		485,775			
148	Duke-Price Power Company, Ltd.	4		335,000		335,000	1,673,119,325	190,400		307,000			
149	Montreal Light, Heat & Power Consolidated	5		274,000		127,000	1,249,312,710	142,200		285,150			
150	West Kootenay Power & Light Company, Ltd.	6		82,400		82,400	580,021,067	66,000		83,500			
151	Winnipeg Electric Company (J)	7		126,850		126,850	518,856,200	59,150		132,700			
152	City of Winnipeg Hydro-Electric System	8		94,600		89,287	486,799,830	55,300		89,100			
153	Canada Northern Power Corporation, Ltd.	9		60,780		60,780	441,150,290	50,200		57,270			
154	British Columbia Electric Railway Company, Ltd. (D)	10		100,600		98,000	405,750,100	46,200	(o)	100,800	(o)		
155	Canadian Niagara Power Company, Ltd.	11			(o)	71,400	282,433,000	32,150					
156	Abitibi Electric Development Company	12		44,700		44,700	204,282,001	23,250					
157	Montreal Island Power Company	13		40,950		40,950	172,307,040	19,600		44,250			
158	Southern Canada Power Company, Ltd.	14		41,000		41,000	168,544,700	19,200		41,000			
159	The Nova Scotia Power Commission	15					159,428,487	18,140					
160	Great Lakes Power Company, Ltd.	16		20,500		20,500	153,646,054	17,500					
161	Calgary Power Company, Ltd.	17		41,000		33,000	145,950,224	16,630		45,300			
	Total						16,560,788,652						
	Mexico												
162	The Mexican Light & Power Company, Ltd.		(o)	124,035	(o)	124,035	691,485,448	78,650	(o)	122,907	(o)		
	Electric Railways and Electrified Railroads												
163	Interborough Rapid Transit Company	1		300,700		300,700	1,168,305,375	133,000		301,830			
164	Williamsburgh Power Plant Corporation (B.-M. T.)	2	(o)	162,900	(o)	162,900	608,371,076	69,300	(o)	162,600	(o)		
165	Chicago Surface Lines	3					354,922,052	40,400					
166	Philadelphia Rapid Transit Company	4		95,507			304,313,972	34,700		102,227			
167	The Pennsylvania Railroad (Long Island City Gen. Station)	5	(o)	99,060	(o)	78,300	291,426,822	33,200	(o)	105,430			
168	Boston Elevated Railway	6		93,030		93,030	244,678,940	27,900		98,490			
169	The New York Central Railroad Company	7		84,000		71,500	228,941,683	26,100		86,300			
170	The New York, New Haven & Hartford Railroad Company	8		43,000		26,600	179,000,000	20,400	(o)	42,800	(o)		
171	St. Louis Public Service Company	9		46,182		13,327	152,489,148	17,350		51,287			
172	Pacific Electric Railway Company	10		47,000			143,901,864	16,400		48,000			
173	Twin City Rapid Transit Company	11	(o)	42,620	(o)	39,560	124,932,815	14,260	(o)	39,798	(o)		
174	Norfolk & Western Railway Company	12		29,500		21,540	99,938,196	11,400		34,300			
175	The Connecticut Company	13				9,600	78,774,178	8,970					
176	Chicago, Milwaukee, St. Paul & Pacific Railroad Company	14					67,439,697	7,670					
	Total						4,047,435,818						

*Certain company names in last year's table do not appear in this. The causes are (1) change of name; (2) absorption or merger into another system, or disintegration of a former system. The following list gives the former names and the names under which the operations are *now included*:

Central Indiana Power Co. Subsidiaries.
See Note (L).

Iowa Railway & Light Corp.
Iowa Electric Light & Power Co.

(a) Company practice varies as to the period for which the peak is determined. For 1932 and 1931 peak data were requested on a 30-minute basis. For that or a shorter period the returns have been entered without comment. Those for a longer period are noted. No distinction has been made between estimated and observed values. In earlier years both instantaneous and 30-minute peaks were called for. Detailed information for those years will be found in corresponding issues of the Supplement.

(b) Less energy supplied to other electric companies.

(c) Metropolitan Edison Co. and New Jersey Power & Light Co.

(d) Excluding purchases for surplus sales to corporations but including purchases to s put of generating stations for use of custo Hudson territory.

(f) Prior to 1932 Pennsylvania Water & Pow

(h) Includes Broad River Power Co. and Le Power Co. Prior to 1931 Broad River P

(i) Pennsylvania Electric Co., Erie Lightin River Power Co. and Youghiogheny Corp.

16,250		37,000		31,800	128,665,860		28,100	117,999,180		29,000	107,715,140		31,500	100,957,540	131		
17,990		40,480		40,000	164,206,522		34,750	151,902,906		31,570	131,017,494		32,530	124,713,651	132		
14,590				23,230	103,802,181										133		
	44,700		189,341,440	21,000	49,000		48,000	195,429,828		22,300			45,000	182,112,000	(m)	41,261	17
	37,000		179,870,560	20,500			38,000	189,781,760		21,650	38,300			198,179,340	(m)	37,200	18
			185,877,236	21,200			48,300	205,587,325		23,400	50,400			176,194,115			14
b)	37,100		178,540,162	20,380			49,600	224,158,905		25,600			60,600	258,682,003	(m)	55,500	22
b)	51,200		190,585,830	21,700	54,100		53,000	195,293,900		22,300	58,800		58,000	219,020,744		56,000	16
			171,071,489	19,530			42,500	175,304,555		19,950	42,400		40,500	162,477,080			
			143,502,741	16,380			28,700	142,385,334		16,250			27,800	122,992,015		30,750	10
	18,815		149,093,897	17,020	43,600		43,220	143,380,401		16,350	41,510		41,940	144,364,260		30,200	11
	11,140		132,960,016	15,180			24,755	139,618,715		15,940							
	33,480		141,315,424	16,130				142,532,297		16,250							
	0		178,076,358	20,300			45,000	232,425,592		26,490							
			146,433,090	16,700			31,000	138,781,877		15,840			25,508	103,748,759			
	0		151,421,136	17,300	38,200		37,500	171,834,023		19,600	40,900		39,400	177,338,443		(K)	15
	68,100		448,574,681	51,200			99,070	441,309,468		50,300			93,170	424,300,963		84,205	38
	24,600		143,522,953	16,380	35,630			178,992,370		20,400			33,000	170,887,397	(m)	31,720	15
	2,840		147,896,790	16,880	31,390			146,368,000		16,700	23,620			145,405,000	(m)	26,480	12
	32,000		134,821,422	15,390													
b)	41,750		123,216,441	14,080	41,000		40,000	129,087,117		14,700	29,610		26,810	115,530,335			
	21,000		157,710,391	18,000			37,400	178,538,313		20,380	41,000			180,016,985		40,000	15
	0		136,633,985	15,600	28,700		27,880	137,457,239		15,700	31,200		29,700	134,571,700		23,500	12
b)	31,700		128,454,330	14,660	36,000		31,500	142,486,580		16,250	37,000		31,800	128,665,860		28,100	11
	29,000		130,452,095	14,900	41,380		40,000	157,500,686		17,990	40,480		40,000	164,206,522		34,750	15
			127,308,532	14,530			27,150	127,822,014		14,590			23,230	103,802,181			
			127,099,816	14,500				123,611,405		14,100				112,617,618			
	13,920		126,791,351	14,470	29,800		25,000	118,703,271		13,550							
			118,526,461	13,530			27,912	115,634,958		13,200			30,300	116,745,731		23,400	9
	25,800		109,489,363	12,500	25,300			103,891,909		11,850							
	77		112,918,808	12,900	23,500		23,144	114,480,898		13,070			23,065	111,870,280			
b)	23,830		106,550,576	12,160													
	24,034		110,485,989	12,600	25,125		24,000	112,612,701		12,850							
			130,897,921	14,940			26,900	121,419,692		13,860			29,440	136,213,088			
	0		100,652,334	11,500				113,823,000		13,000				119,716,000			
	699,630		4,387,316,157	500,800	943,710		937,320	5,077,430,835		580,000	857,950		847,710	5,071,853,732		794,430	4,42
			3,436,436,460	392,300	545,600			3,226,014,549		368,000	538,300			3,726,436,341		532,945	3,40
	485,075		2,414,375,792	275,600	451,700		450,000	2,525,560,158		288,000	395,000		387,000	2,090,788,460		280,000	1,29
	307,000		1,518,632,376	173,400	341,000		341,000	2,012,869,376		229,000	351,000		351,000	2,093,829,000		315,000	2,09
	142,700		1,557,929,949	177,800	312,075		310,000	1,650,636,536		188,300	292,020			1,568,864,226	(m)	279,250	1,45
	83,500		591,772,849	67,500			83,700	599,257,403		68,400			74,800	539,626,687		39,700	51
	132,700		614,665,600	70,200	121,500		119,750	598,508,500		68,400	125,400		124,200	703,982,200		129,000	65
	85,845		412,080,147	47,000	89,223			414,195,787		47,300	73,400			445,579,835		74,940	40
	57,270		418,226,810	47,700	51,680		50,000	367,130,780		41,900	46,420		46,000	347,797,680		45,000	34
b)	100,800		425,510,139	48,500	104,000		100,200	437,731,126		50,000	98,900		94,000	418,075,320		94,600	39
	74,500		490,148,000	55,950				614,411,500		70,100				632,261,900			62
	44,250		146,048,890	16,670	41,225		41,000	105,805,180		12,070							
	41,000		159,873,880	18,250	40,800			170,619,052		19,480	31,000		31,000	149,105,920	(m)	31,700	14
			173,924,966	19,850				151,414,019		17,850							
	35,600		188,668,281	21,500			44,860	139,302,262		15,900	29,500			126,876,336	(m)	26,100	10
b)	122,907		691,150,190	78,900			121,485	681,822,792		77,800			111,140	641,828,127	(m)	107,608	62
	301,830		1,198,884,267	136,900			303,400	1,228,301,211		140,000			304,460	1,217,047,463		298,760	1,17
b)	162,600		642,157,665	73,300			170,000	618,219,724		70,600	(o) 154,100		159,000	599,442,974		150,000	56
			595,733,093	68,000			197,574	624,776,062		71,200			200,698	(p) 664,908,358		195,730	(r) 59
	0		333,822,958	38,100			111,750	366,341,403		41,800			116,162	384,076,148		110,071	37
	95,600		330,309,340	37,700	115,000		86,800	343,354,637		39,200	104,000		89,800	343,646,828		87,700	33
	98,490		257,065,945	29,350	108,108		103,194	(F) 270,054,975		30,800	95,755		91,403	247,473,090		91,576	25
	73,000		250,573,893	28,600	85,400		71,600	251,780,404		28,600	86,500		75,400	247,599,220		68,280	23
o)	28,900		213,400,000	24,300			43,000	225,941,425		25,800			41,600	209,370,023		40,750	20
	16,121		159,433,615	18,200	58,780		57,395	170,343,455		19,450							
	0		157,888,334	18,000	51,000		48,000	169,134,719		19,300	55,000		48,000	182,813,761		48,000	18
o)	38,580		126,174,466	14,400			48,000	133,337,207		15,200			49,732	140,190,412		46,865	13
	27,300		116,745,039	13,300	31,500		24,000	132,339,094		15,100			30,000	134,368,264		30,000	11
	10,100		89,641,092	10,220			25,050	106,660,046		12,180			16,500	120,427,038		18,500	10
			91,042,859	10,390				124,593,517		14,200				156,186,340			10

es to other electrical
s to supplement out-
customers in Central

r Power Co. only.
nd Lexington Water
ver Power Co. only.
ighting Co., Clarion
eny Hydro-Electric

(j) Includes effect of supply to neighboring system.
(k) Bridgeport division only.
(l) For Texas Division.
(m) Instantaneous.
(n) Over 30-minute period.
(o) Over one-hour period. Actual or estimated.
(p) A.-c. input.
(r) Output measured on d.c. side.
(A) Energy produced from "Water Sold" (96,457,243 kw.-hr.) is not included in 1932 output. Its inclusion, as in other years, would increase total to 3,266,815,903 kw.-hr.

(B) Includes the Southern Sierras Power Co., Nevada-California Power Co. and Yuma Utilities Co.
(C) Canadian Niagara Power Co., Ltd., (see Canada), included in Niagara Hudson Power Corp. System, as is also the St. Lawrence Power Co., Ltd. (Canada).
(D) Lower mainland system only.
(E) Includes Kentucky & West Virginia Power Co., Inc., and Kingsport Utilities, Inc., in 1932, 1931 and 1930.
(F) A.-c. output. Prior to 1930 the output given is kw.-hr. generated as d.c. or after conversion to d.c.
(G) On generating plant only.

(H) Includes in 1932 and 1931 N
lyn Edison Co., Inc., New Y
& Power Co. and United E
in 1930, 1929, 1928 also Yon
Co. In 1927 also included
Northern Westchester Lighti
Railroad Co. and Bronx G
Brooklyn Edison Co., Inc. (
30, 1927).
(I) Covers the period July 1 to D

2,300			45,000	182,112,000	(m)	41,261	172,781,000		46,000	166,244,000		36,392	137,786,000	111			
1,650		38,300		198,179,340	(m)	37,200	186,242,950		33,700	174,146,677			164,932,829	112			

40,500	40,500	172,532,740	19,650	(o) 44,700	(o) 44,700	189,341,440	21,600	49,000	48,000	195,429,828		2,30
36,500	36,500	165,392,410	18,850	37,000	37,000	179,870,560	20,500	.....	38,000	189,781,760		1,65
44,600	(o) 44,600	161,601,100	18,410	(o) 44,600	.....	185,877,236	21,200	.....	48,300	205,587,325		23,40
33,100	(o) 33,100	155,431,973	17,710	(o) 37,100	(o) 37,100	178,540,162	20,380	.....	49,600	224,158,905		25,60
44,200	(o) 44,200	153,982,440	17,530	(o) 51,200	(o) 51,200	190,585,830	21,700	54,100	53,000	195,293,900		22,30
34,428	25,858	153,647,061	17,500	39,311	.....	171,071,489	19,530	.....	42,500	175,304,555		19,95
.....	33,100	147,425,196	16,790	29,650	.....	143,502,741	16,380	.....	28,700	142,385,334		16,25
39,100	26,800	142,240,346	16,200	39,815	18,815	149,093,897	17,020	43,600	43,220	143,380,401		16,35
25,700	14,300	139,285,039	15,870	43,452	11,140	132,960,016	15,180	.....	24,755	139,618,715		15,94
.....	.....	137,742,749	15,690	40,403	33,480	141,315,424	16,130	.....	.....	142,532,297		16,25
34,000	.....	132,689,604	15,110	39,000	0	178,076,358	20,300	.....	45,000	232,425,592		26,49
30,372	.....	132,226,989	15,070	32,074	.....	146,433,090	16,700	.....	31,000	138,781,877		15,84
32,791	.....	131,320,248	14,970	35,000	0	151,421,136	17,300	38,200	37,500	171,834,023		19,60
36,300	.....	130,816,594	14,910	90,750	68,100	448,574,681	51,200	.....	99,070	441,309,468		50,30
28,200	28,200	127,731,492	14,540	27,840	24,600	143,522,953	16,380	35,630	.....	178,992,370		20,40
28,200	20,500	126,841,303	14,450	29,640	2,840	147,896,790	16,880	31,390	.....	146,368,000		16,70
31,225	31,225	125,997,054	14,350	32,000	32,000	134,821,422	15,390	.....	.....	.....		.....
26,710	39,000	124,824,746	14,220	(o) 25,130	(o) 41,750	123,216,441	14,080	41,000	40,000	129,087,117		14,70
31,370	19,000	123,467,451	14,070	35,739	21,000	157,710,391	18,000	.....	37,400	178,538,313		20,38
26,931	.....	119,849,982	13,660	28,119	0	136,633,985	15,600	28,700	27,880	137,457,239		15,70
30,600	(o) 30,600	116,497,340	13,280	(o) 31,700	(o) 31,700	128,454,330	14,660	36,000	31,500	142,486,580		16,25
28,820	26,000	116,424,946	13,270	33,590	29,000	130,452,095	14,900	41,380	40,000	157,500,686		17,99
24,500	.....	114,104,546	13,000	26,000	.....	127,308,532	14,530	.....	27,150	127,822,014		14,59
.....	.....	110,185,257	12,540	.....	.....	.....	.....	.....	.....	.....		.....
24,500	25,200	109,398,945	12,460	.....	.....	.....	.....	.....	.....	.....		.....
.....	.....	104,430,631	11,900	.....	.....	127,099,816	14,500	.....	.....	123,611,405		14,10
27,740	14,020	103,954,670	11,840	31,360	13,920	126,791,351	14,470	29,800	25,000	118,703,271		13,55
25,305	4,620	103,725,735	11,820	26,783	.....	118,526,461	13,530	.....	27,912	115,634,958		13,20
26,700	26,700	98,446,191	11,210	25,800	25,800	109,489,363	12,500	25,300	.....	103,891,909		11,85
20,030	101	93,796,831	10,680	22,387	77	112,918,808	12,900	23,500	23,144	114,480,898		13,07
21,970	(o) 21,970	91,388,626	10,400	(o) 23,830	(o) 23,830	106,550,576	12,160	.....	.....	.....		.....
19,900	19,900	89,443,680	10,180	24,034	24,034	110,485,989	12,600	25,125	24,000	112,612,701		12,85
26,100	(o) 26,100	89,262,093	10,170	31,200	.....	130,897,921	14,940	.....	26,900	121,419,692		13,86
21,584	.....	86,783,762	9,880	26,980	0	100,652,334	11,500	.....	.....	113,823,000		13,00
.....	.....	86,913,281,452	.....	.....	.....	.....	.....	.....	.....	.....		.....
828,280	527,420	4,221,001,199	481,000	915,945	699,630	4,387,316,157	500,800	943,710	937,320	5,077,430,835		580,00
618,100	474,500	3,170,358,660	361,000	540,500	.....	3,436,436,460	392,300	545,600	.....	3,226,014,549		368,00
503,705	503,005	2,527,827,765	288,000	485,775	485,075	2,414,375,792	275,600	451,700	450,000	2,525,560,158		288,00
335,000	335,000	1,673,119,325	190,400	307,000	307,000	1,518,632,376	173,400	341,000	341,000	2,012,869,376		229,00
274,000	127,000	1,249,312,710	142,200	285,150	142,700	1,557,929,949	177,800	312,075	310,000	1,650,636,536		188,30
82,400	82,400	580,021,067	66,000	83,500	83,500	591,772,849	67,500	.....	83,700	599,257,403		68,40
126,850	126,850	518,856,200	59,150	132,700	132,700	614,665,600	70,200	121,500	119,750	598,508,500		68,40
94,600	89,287	486,799,830	55,300	89,100	85,845	412,080,147	47,000	89,223	.....	414,195,787		47,30
60,780	60,780	441,150,290	50,200	57,270	57,270	418,226,810	47,700	51,680	50,000	367,130,780		41,90
100,600	98,000	405,750,100	46,200	(o) 100,800	(o) 100,800	425,510,139	48,500	104,000	100,200	437,731,126		50,00
.....	(o) 71,400	282,433,000	32,150	.....	74,500	490,148,000	55,950	.....	.....	614,411,500		70,10
44,700	44,700	204,282,001	23,250	.....	.....	.....	.....	.....	.....	.....		.....
40,950	40,950	172,307,040	19,600	44,250	44,250	146,048,890	16,670	41,225	41,000	105,805,180		12,07
41,000	41,000	168,544,700	19,200	41,000	41,000	159,873,880	18,250	40,800	.....	170,619,052		19,48
.....	.....	159,428,487	18,140	.....	.....	173,924,966	19,850	.....	.....	151,414,019		17,85
20,500	20,500	153,646,054	17,500	.....	.....	.....	.....	.....	.....	.....		.....
41,000	33,000	145,950,224	16,630	45,300	35,600	188,668,281	21,500	.....	44,860	139,302,262		15,90
.....	.....	16,560,788,652	.....	.....	.....	.....	.....	.....	.....	.....		.....
124,035	(o) 124,035	691,485,448	78,650	(o) 122,907	(o) 122,907	691,150,190	78,900	.....	121,485	681,822,792		77,80
300,700	300,700	1,168,305,375	133,000	301,830	301,830	1,198,884,267	136,900	.....	303,400	1,228,301,211		140,00
162,900	(o) 162,900	608,371,076	69,300	(o) 162,600	(o) 162,600	642,157,665	73,300	.....	170,000	618,219,724		70,60
.....	.....	354,922,052	40,400	.....	.....	595,733,093	68,000	.....	197,574	624,776,062		71,20
95,507	.....	304,313,972	34,700	102,227	0	333,822,958	38,100	.....	111,750	366,341,403		41,80
99,060	(o) 78,300	291,426,822	33,200	(o) 105,430	95,600	330,309,340	37,700	115,000	86,800	343,354,637		39,20
93,030	93,030	244,678,940	27,900	98,490	98,490	257,065,945	29,350	108,108	103,194	(F) 270,054,975		30,80
84,000	71,500	228,941,683	26,100	86,300	73,000	250,573,893	28,600	85,400	71,600	251,780,404		28,60
43,000	26,600	179,000,000	20,400	(o) 42,800	(o) 28,900	213,400,000	24,300	.....	43,000	225,941,425		25,80
46,182	13,327	152,489,148	17,350	51,287	16,121	159,433,615	18,200	58,780	57,395	170,343,455		19,45
47,000	.....	143,901,864	16,400	48,000	0	157,888,334	18,000	51,000	48,000	169,134,719		19,30
42,620	(o) 39,560	124,932,815	14,260	(o) 39,798	(o) 38,580	126,174,466	14,400	.....	48,000	133,337,207		15,20
29,500	21,540	99,938,196	11,400	34,300	27,300	116,745,039	13,300	31,500	24,000	132,339,094		15,10
.....	9,600	78,774,178	8,970	.....	10,100	89,641,092	10,220	.....	25,050	106,660,046		12,18
.....	.....	67,439,697	7,670	.....	.....	91,042,859	10,390	.....	.....	124,593,517		14,20
.....	.....	4,047,435,818	.....	.....	.....	.....	.....	.....	.....	.....		.....

r 1932 and 1931 peak data were
te basis. For that or a shorter
been entered without comment.
l are noted. No distinction has
mated and observed values. In
ntaneous and 30-minute peaks
l information for those years will
g issues of the Supplement.
other electric companies.
Co. and New Jersey Power &

(d) Excluding purchases for surplus sales to other electrical corporations but including purchases to supplement output of generating stations for use of customers in Central Hudson territory.

(f) Prior to 1932 Pennsylvania Water & Power Co. only.

(h) Includes Broad River Power Co. and Lexington Water Power Co. Prior to 1931 Broad River Power Co. only.

(i) Pennsylvania Electric Co., Erie Lighting Co., Clarion River Power Co. and Youghiogheny Hydro-Electric Corp.

(j) Includes effect of supply to neighboring system.
(k) Bridgeport division only.
(l) For Texas Division.
(m) Instantaneous.
(n) Over 30-minute period.
(o) Over one-hour period. Actual or estimated.
(p) A.-c. input.
(r) Output measured on d.c. side.
(M) Energy produced from "Water Sold" (96,457,243 kw.-hr.) is not included in 1932 output. Its inclusion, as in other years, would increase total to 3,266,815,903 kw.-hr.

(B) Includes the Sou
California Power C
(C) Canadian Niagara
cluded in Niagara
also the St. Lawren
(D) Lower mainland sy
(E) Includes Kentucky
Kingsport Utilities
(F) A.-c. output. Prio
generated as d.c. o
(G) On generating plan

2,300		45,000	182,112,000	(m)	41,261	172,781,000		46,000	166,244,000	36,392	137,786,000	111
1,650	38,300		198,179,340	(m)	37,200	186,242,950		33,700	174,146,677		164,932,820	112
3,400	50,400		176,194,115			149,811,913			153,364,676	(o) 33,200	150,635,115	113
5,600		60,600	258,682,003	(m)	55,500	226,034,240	(o)	61,000	262,409,515	62,280	214,669,321	114
2,300	58,800	58,000	219,020,744		56,000	167,613,529		50,500	173,617,378	52,600	172,222,651	115
9,950	42,400	40,500	162,477,080									116
6,250		27,800	122,992,015		30,750	108,519,670						117
6,350	41,510	41,940	144,364,260		30,200	114,835,060	(n)	30,580	116,194,720		107,971,800	118
5,940												119
6,250												120
6,490												121
5,840		25,508	103,748,759									122
9,600	40,900	39,400	177,338,443		(K)	156,467,174		31,727	135,692,265	28,600	117,679,234	123
0,300		93,170	424,300,963		84,205	383,337,429		74,100	305,326,889	80,070	334,518,201	124
0,400		33,000	170,887,397	(m)	31,720	152,885,453		25,340	114,195,401	(n) 27,620	100,462,550	125
6,700	23,620		145,405,000	(m)	26,480	122,579,000		24,600	105,634,000	23,140	104,648,573	126
												127
4,700	29,610	26,810	115,530,335									128
0,380	41,000		180,016,985		40,000	152,957,600		34,000	131,861,909	32,900	123,632,339	129
5,700	31,200	29,700	134,571,700		23,500	122,337,055	(o)	25,000	109,786,578	22,500	111,341,210	130
6,250	37,000	31,800	128,665,860		28,100	117,999,180		29,000	107,715,140	31,500	100,957,540	131
7,990	40,480	40,000	164,206,522		34,750	151,902,906		31,570	131,017,494	32,530	124,713,651	132
4,590		23,230	103,802,181									133
												134
												135
4,100			112,617,618									136
3,550												137
3,200		30,300	116,745,731		23,400	93,469,303	(n)	19,000	75,389,189			138
1,850												139
3,070		23,065	111,870,280									140
												141
2,850												142
3,860		29,440	136,213,088									143
3,000			119,716,000			104,830,000						144
80,000	857,950	847,710	5,071,853,732		794,430	4,429,404,096		746,275	4,133,501,842	711,220	3,867,398,041	145
68,000	538,300		3,726,436,341		532,945	3,409,717,522		420,300	3,021,201,950	392,330	2,557,613,443	146
88,000	395,000	387,000	2,090,788,460		280,000	1,297,239,606						147
29,000	351,000	351,000	2,093,829,000		315,000	2,096,903,000			1,719,820,588			148
88,300	292,020		1,568,864,226	(m)	279,250	1,450,484,998		256,760	1,354,895,244	252,000	1,251,502,612	149
68,400		74,800	539,626,687		39,700	516,071,474	(n)	65,600	476,999,100		410,327,600	150
68,400	125,400	124,200	703,982,200		129,000	654,491,510		112,000	511,103,200	66,200	285,508,300	151
47,300	73,400		445,579,835		74,940	400,668,600		75,834	358,371,100	70,844	324,993,710	152
41,900	46,420	46,000	347,797,680		45,000	343,930,010		43,690	305,415,945			153
50,000	98,900	94,000	418,075,320		94,600	390,564,500		87,400	350,402,700	79,000	333,654,900	154
70,100			632,261,900			621,423,800			604,597,700		591,893,200	155
												156
12,070												157
19,480	31,000	31,000	149,105,920	(m)	31,700	146,233,060	(n)	26,300	125,319,394			158
17,850												159
												160
15,900	29,500		126,876,336	(m)	26,100	104,577,805						161
77,800		111,140	641,828,127	(m)	107,608	628,832,675	(o)	102,386	606,245,844		594,046,265	162
40,000		304,460	1,217,047,463		298,760	1,177,155,819	(n)	284,660	1,103,063,438		1,063,717,242	163
70,600	(o) 154,100	159,000	599,442,974		150,000	568,889,703	(o)	138,200	544,081,653	(o) 138,100	542,141,625	164
71,200		200,698	(p) 664,908,358		195,730	(r) 592,545,223		300,660	(r) 577,710,827	264,000	(r) 581,706,072	165
41,800		116,162	384,076,148		110,071	377,326,475	(n)	120,318	371,731,556		390,915,742	166
39,200	104,000	89,800	343,646,828		87,700	333,037,210		99,600	307,432,390	88,800	286,533,764	167
30,800	95,755	91,403	247,473,090		91,576	252,965,140		94,457	243,925,965	94,490	257,696,595	168
28,600	86,500	75,400	247,599,220		68,280	230,003,185		75,000	222,131,354	73,000	205,649,608	169
25,800		41,600	209,370,023		40,750	201,191,225		50,500	189,691,700	(G) 43,000	209,658,870	170
19,450												171
19,300	55,000	48,000	182,813,761		48,000	184,759,206		54,000	190,485,000	52,000	187,975,148	172
15,200		49,732	140,190,412		46,865	135,530,869	(o)	45,333	137,695,684		140,216,985	173
15,100		30,000	134,368,264		30,000	127,944,156			123,759,732	38,500	106,426,752	174
12,180		16,500	120,427,038		18,500	109,993,477			114,168,609		115,769,700	175
14,200			156,186,340			162,274,409			148,560,111		138,083,293	176

Southern Sierras Power Co., Nevada-
ver Co. and Yuma Utilities Co.
agara Power Co., Ltd., (see Canada), in-
agara Hudson Power Corp. System, as is
awrence Power Co., Ltd. (Canada).
nd system only.
ucky & West Virginia Power Co., Inc., and
ilities, Inc., in 1932, 1931 and 1930.
Prior to 1930 the output given is kw.-hr.
l.c. or after conversion to d.c.
plant only.

(H) Includes in 1932 and 1931 New York Edison Co., Brooklyn Edison Co., Inc., New York & Queens Electric Light & Power Co. and United Electric Light & Power Co.; in 1930, 1929, 1928 also Yonkers Electric Light & Power Co. In 1927 also included Westchester Lighting Co., Northern Westchester Lighting Co., Peekskill Lighting & Railroad Co. and Bronx Gas & Electric Co. but not Brooklyn Edison Co., Inc. (see also Supplement of April 30, 1927).

(I) Covers the period July 1 to December 31.

(J) Includes Manitoba Power Co., Ltd., also in 1932 and 1931 Northwestern Power Co., Ltd.

(K) Peak included in Illinois Electric Power Co.

(L) Operations in 1932 not comparable with earlier years. By merger of Indiana Electric Corp. (former subsidiary of Central Indiana Power Co.) into Public Service Co. of Indiana the latter was enlarged and Northern Indiana Power Co. became the only subsidiary of Central Indiana Power Co. Figures opposite Northern Indiana Power Co. prior to 1932 are for Central Indiana Power Co. Subs.

For explanations and comments relating to these statistics the *Electrical World* of May 6, 1933, should be consulted.

The output of a few companies that formerly exceeded 100,000,000 kw.-hr. fell short in 1932. They have been retained.

Table II—Detailed Data on G of Public Utility Systems Hav

Line No.	Section and System	Generator Rating, Dec. 31, 1932				Generated and Purchased Output, 1932			
		Fuel Burning Plants		Hydro Plants					
		No. of Plants	Rating of Generators, Kw.	No. of Plants	Rating of Generators, Kw.	Total Output, Kw.-Hr.	Generated (Net), Kw.-Hr.	Purchased, Kw.-Hr.	Domest Servic
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	New England States								
1	New England Power Association System	19	415,250	28	338,180	2,032,576,325	1,485,377,705	547,198,620	187,01
2	The Edison Electric Illuminating Company of Boston	3	375,860	1	(L) 50	1,048,824,142	709,424,807	339,399,335	179,94
3	The Connecticut Electric Service Company System	4	109,220	14	58,190	536,775,777	310,515,148	226,260,629	76,65
4	Western Massachusetts Companies System	3	(L) 92,500	9	(L) 99,260	433,146,000	318,613,000	114,533,000	43,07
5	Central Maine Power Company System	3	13,572	26	109,941	361,974,791	352,445,885	9,528,906	30,24
6	Montaup Electric Company	1	73,000	0	0	333,403,000	304,069,000	29,334,000	
7	The Hartford Electric Light Company	2	126,000	1	1,500	281,846,464	191,656,770	90,189,694	42,53
8	The United Illuminating Company	2	170,000	0	0	250,832,000	250,832,000	0	54,36
9	Public Service Company of New Hampshire	3	43,250	24	40,061	184,063,033	177,330,683	6,732,350	19,68
10	Blackstone Valley Gas & Electric Company	1	33,500	3	1,750	179,572,365	4,374,539	175,197,826	14,84
11	New Bedford Gas & Edison Light Company	1	92,000	0	0	153,982,440	153,982,440	0	11,83
12	Cumberland County Power & Light Company	2	36,000	8	25,812	142,240,346	118,242,146	23,998,200	20,71
13	The Connecticut Power Company	0	0	2	9,600	139,285,039	44,984,149	94,300,890	12,97
14	Bangor Hydro-Electric Company	0	0	12	30,935	91,388,626	91,344,826	43,800	(i) 13,27
	Totals for section	44	1,580,152	128	715,279	6,169,910,348	4,513,193,098	1,656,717,250	
	Middle Atlantic States								
15	Niagara Hudson Power Corporation System (j)	8	(L) 611,340	102	(L) 1,040,634	5,378,434,187	4,557,297,247	821,136,940	388,46
16	The New York Edison System (l)	7	2,349,700	0	0	4,981,200,000	4,957,300,000	23,900,000	690,30
17	Philadelphia Electric Company System	8	(x) 704,000	3	253,765	2,860,721,532	2,728,762,114	131,959,418	322,89
18	Public Service Electric & Gas Company (N. J.)	5	649,450	0	0	2,037,604,869	1,784,209,643	(g) 253,395,226	(b) 334,88
19	The West Penn Electric Company Subsidiaries	28	(D) 452,053	12	56,465	1,457,715,339	1,431,340,339	26,375,000	144,63
20	Pennsylvania Power & Light Company	19	320,042	20	44,692	1,382,587,998	1,143,810,290	238,777,708	133,90
21	Duquesne Light Company	3	(p) 439,000	0	0	1,176,868,998	1,161,617,552	15,251,446	199,60
22	Pennsylvania Wtr. & Pwr. Co. and Safe Harbor Wtr. Pwr. Corp.	1	20,000	2	223,000	933,430,500	931,730,100	1,700,400	
23	Assoc. Gas. & Elec. System (Eastern Pa. & N. J. Group) (q)	4	219,000	5	22,198	664,678,386	424,302,568	240,375,818	61,97
24	N. Y. State Elec. & Gas Corp. Group (Assoc. G. & E. System)	9	60,085	28	14,276	412,760,797	177,237,365	235,523,432	72,92
25	Assoc. Gas & Elec. System (West. Penna. Group) (s)	10	107,856	2	48,000	370,582,826	333,086,260	37,496,566	44,49
26	Westchester Lighting Company	3	10,550	0	0	360,023,800	0	(t) 360,023,800	(o) 162,26
27	Rochester Gas & Elec. Corp. Group (Assoc. G. & E. System)	6	77,975	14	48,950	336,846,546	225,071,469	111,775,077	58,67
28	Central Hudson Gas & Electric Corporation	1	14,000	6	24,100	324,958,106	87,931,700	237,026,406	31,24
29	The Yonkers Electric Light & Power Company	0	0	0	0	318,059,700	0	(t) 318,059,700	(o) 47,24
30	Long Island Lighting Company System	10	170,225	0	0	258,926,233	258,920,285	5,948	71,84
31	The Scranton Electric Company	4	(w) 123,500	0	0	242,866,592	241,551,582	1,315,010	28,87
32	Penn Central Light & Power Company	4	76,350	3	4,420	212,223,069	211,245,876	977,193	26,67
33	Jersey Central Power & Light Company	8	162,200	1	350	198,850,022	276,499,142	(y) —77,649,120	40,14
34	Atlantic City Electric Company	3	(x) 123,500	0	0	192,354,557	192,354,557	0	36,92
35	Pennsylvania Power Company	0	0	0	0	132,689,604	0	132,689,604	19,39
36	Luzerne County Gas & Electric Corporation	2	55,000	0	0	124,824,746	150,054,110	—25,229,364	13,27
37	Staten Island Edison Corporation	1	47,500	0	0	116,497,340	112,303,740	4,193,600	20,57
	Totals for section (j)	144	6,793,326	198	1,780,850	24,475,705,747	21,386,625,939	3,089,079,808	
	East North Central States								
38	Commonwealth Edison Company	5	1,090,500	0	0	3,686,443,000	2,056,745,000	(l) 1,629,698,000	550,02
39	The Detroit Edison Company	4	837,000	(L) 7	9,160	1,851,223,900	1,840,514,300	10,709,600	(k) 332,67
40	The Ohio Power Company	14	(D) 387,845	3	1,350	1,399,680,283	1,345,401,334	54,278,949	83,14
41	Public Service Company of Northern Illinois	14	(L) 425,735	3	4,100	1,331,986,990	622,579,552	709,407,438	150,78
42	Super-Power Company of Illinois	1	(f) 215,000	0	0	1,232,552,866	1,192,511,710	40,041,156	
43	The Cleveland Electric Illuminating Company	4	478,000	0	0	1,201,175,042	1,200,318,242	856,800	184,84
44	Columbia Gas & Electric Corporation System	6	389,250	0	0	1,072,227,180	991,842,000	80,385,180	154,84
45	The North American Co. System (Wis.-Michigan Group)	10	421,589	11	16,435	971,760,512	850,607,794	121,152,718	163,28
46	Chicago District Electric Generating Corporation	1	200,000	0	0	940,504,000	940,504,000	0	
47	Consumers Power Company	8	264,000	37	141,950	894,759,956	801,352,979	(g) 93,406,977	165,27
48	Ohio Edison Company	5	311,500	1	2,175	693,551,026	611,311,550	82,239,476	95,12
49	Public Service Company of Indiana	8	(L) 119,980	2	4,280	533,569,196	417,611,058	115,958,138	43,13
50	Illinois Power & Light Corporation (Illinois)	17	82,110	1	3,590	458,872,819	83,572,163	375,300,656	62,19
51	Indiana & Michigan Electric Company	2	93,500	5	22,244	408,462,952	209,792,152	198,670,800	29,29
52	Ohio Public Service Company	8	130,100	0	0	395,239,555	287,997,400	107,242,155	42,27
53	Toledo Edison Company	3	160,200	2	6,800	389,779,858	225,435,151	164,344,707	43,50
54	Northern Indiana Public Service Company	5	102,787	9	(L) 17,145	373,324,371	332,654,602	40,669,769	30,71
55	Central Illinois Public Service Company	8	84,280	0	0	320,293,529	161,158,919	159,134,610	45,28
56	Indianapolis Power & Light Company	4	163,200	0	0	302,836,096	244,121,612	58,714,484	43,98
57	Wisconsin Power & Light Company	7	54,384	36	37,516	271,008,229	222,075,427	48,932,802	(R) 30,52
58	The Columbus Railway, Power & Light Company	2	132,500	0	0	261,830,100	261,830,100	0	49,21
59	Illinois Electric Power Company	2	79,400	0	0	203,869,548	203,869,548	0	
60	City of Detroit, Public Lighting Commission	1	80,000	0	0	190,060,990	172,740,000	17,320,990	

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Generator Rating, Output, Customers and Distribution of Energy

aving an Output Exceeding 100,000,000 Kw.-Hr. During 1932

Distribution of Output in Kilowatt-Hours, 1932									Number of Cu			
omestic ervice (10)	Commercial, Small Light and Power (Retail) (11)	Commercial, Large Light and Power (Wholesale) (12)	Municipal Service (Street Lighting, etc.) (13)	Other Sales to Ultimate Consumers (14)	Electric Railway Operation (Including Company-Owned) (15)	Other Public Utilities (Including Municipal Systems) (16)	Used by Company (17)	Not Accounted for (Losses) (18)	Domestic (19)	Commercial Small Light and Power (Retail) (20)	Commercial Large Light and Power (Wholesale) (21)	M S (Li
37,016,014	128,297,945	548,165,313	42,319,756	33,533,872	37,409,382	738,099,722	38,776,164	278,958,157	407,819	61,883	12,136	
79,941,658	188,930,393	271,652,579	32,233,778	.....	6,249,680	205,139,795	5,065,253	159,611,006	(a) 306,748	(a) 70,250	(a) 529	(a)
76,651,121	34,881,986	180,457,249	10,190,766	.....	44,332,140	95,038,903	20,710,143	74,513,469	120,697	16,957	2,824	
43,074,000	29,386,000	117,855,000	9,873,000	(c) 12,066,000	23,890,000	125,798,000	5,675,000	65,529,000	71,794	11,776	2,845	
30,247,997	19,838,117	205,809,876	8,205,833	3,111,235	8,567,651	26,645,370	7,537,109	52,011,603	62,322	10,961	1,907	
0	0	0	0	0	0	333,403,000	0	(d)	0	0	0	
42,538,548	57,235,168	37,807,182	6,515,398	0	20,529,100	87,243,697	2,311,450	27,665,921	59,606	9,502	69	
54,364,934	49,054,290	106,193,000	7,833,216	.....	.....	4,837,500	3,643,668	24,905,392	101,097	14,163	3,645	
19,687,703	12,523,598	45,844,142	5,367,605	.....	7,499,263	63,279,336	3,352,491	26,508,895	43,305	7,295	1,723	
14,844,709	15,577,611	103,112,675	3,163,199	(G) 405,171	0	20,171,697	554,222	21,743,081	39,225	5,862	416	
11,834,295	7,792,101	89,538,219	4,037,532	.....	.....	23,067,058	2,502,572	15,210,663	32,786	4,912	986	
20,717,740	18,080,237	53,389,155	4,797,808	791,500	14,426,302	6,818,600	3,048,454	20,170,550	38,713	6,565	1,763	
12,974,549	6,339,766	20,113,935	1,698,264	.....	.....	91,972,578	896,868	5,289,079	(h) 18,474	(h) 2,982	(h) 879	(h)
3,277,014	(i, z)	(z) 55,893,637	1,347,994	.....	3,314,050	1,699,312	455,902	15,400,717	(i) 24,384	(i, z)	(z) 4,318	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
38,462,648	342,441,508	2,520,653,273	111,268,123	.....	153,735,835	1,068,027,252	55,460,932	738,384,616	550,004	82,903	4,399	
90,300,000	901,400,000	1,826,800,000	204,000,000	.....	288,200,000	376,700,000	.....	(n) 693,800,000	(a) 1,567,199	(a) 379,241	(a) 14,229	(a)
22,896,710	217,480,595	1,001,691,701	144,020,203	260,680	465,630,861	348,281,622	29,499,042	330,960,118	513,610	89,872	19,312	
34,883,606	(z)	(z) 1,140,987,902	66,685,530	.....	174,140,608	1,698,880	18,581,706	300,626,637	(o) 846,883	(o)	(o)	
44,639,333	95,596,397	912,449,029	21,832,554	.....	66,157,871	14,353,792	.....	202,686,363	233,920	40,871	6,610	
83,902,233	124,042,455	759,558,040	47,383,378	(G) 8,437,042	64,593,501	82,206,214	5,914,532	156,550,603	276,594	51,376	4,337	
99,602,499	104,928,323	531,782,350	34,648,933	.....	183,328,749	3,759,776	3,562,297	115,256,071	266,623	29,709	1,915	
0	0	0	0	(r) 763,700	0	875,390,700	.....	57,276,100	0	0	0	
61,971,084	42,504,131	252,552,245	11,480,115	.....	28,264,994	164,173,402	9,786,228	93,946,187	120,974	21,606	3,836	
72,928,356	34,750,749	150,911,138	21,911,122	.....	4,072,922	68,994,350	3,151,590	56,040,570	122,925	19,010	4,129	
44,499,855	27,886,816	177,274,482	6,181,375	.....	6,219,750	41,064,734	1,491,017	65,964,797	90,350	13,673	2,836	
52,268,207	(o)	(o)	37,799,022	.....	.....	(u) 111,938,478	2,835,900	45,182,193	(h,v) 140,046	(v)	(v)	
58,671,993	71,813,782	80,360,101	28,087,860	.....	29,857,399	2,665,652	20,385,214	45,004,545	104,836	12,363	933	
31,244,449	29,239,090	37,009,548	10,784,887	.....	1,023,500	176,188,113	3,517,123	35,951,396	51,214	12,862	106	
37,244,202	(o)	(o)	8,276,252	.....	.....	(e) 251,219,157	682,040	10,638,049	(h,v) 39,912	(v)	(v)	
71,849,506	33,595,706	56,114,866	24,257,743	275,928	12,929,500	1,820,491	6,534,174	51,548,319	120,248	17,336	6,708	
28,874,870	29,044,245	129,968,792	5,204,126	.....	19,793,932	1,892,715	4,695,963	23,391,949	64,862	10,815	196	
26,676,482	14,137,713	104,179,370	3,220,668	.....	10,570,270	21,844,239	1,911,994	29,682,333	48,165	6,237	1,630	
40,143,825	17,076,586	56,940,466	21,923,510	6,956,306	8,561,520	4,811,200	5,523,514	36,913,095	69,465	11,144	1,365	
36,922,404	28,399,629	77,797,577	10,547,424	.....	452,300	1,260,220	1,832,338	35,142,665	68,211	14,025	2,132	
19,393,085	14,957,793	74,587,259	3,140,078	.....	3,543,750	4,691,855	742,480	11,633,304	34,486	4,495	98	
13,271,596	6,325,066	75,799,009	2,631,231	.....	10,210,789	848,058	1,519,443	14,219,554	31,352	3,116	857	
20,571,433	9,421,671	34,748,523	11,659,655	.....	22,556,046	2,964,800	1,054,373	13,520,839	36,456	5,046	828	
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
50,024,000	456,255,000	1,270,102,000	117,730,000	104,000	800,437,000	[See Col. (9)]	18,628,000	473,163,000	(B) 759,675	125,509	3,119	
32,677,234	408,001,232	675,247,059	56,576,839	.....	59,602,645	64,369,380	26,459,700	228,289,811	(k) 450,603	77,761	432	
83,146,152	84,244,647	376,218,624	13,733,179	23,655,378	8,597,426	682,586,792	4,657,167	122,840,918	169,269	32,427	423	
50,780,565	83,754,549	252,358,741	80,366,525	.....	82,965,282	511,949,927	13,039,066	156,772,335	235,068	32,707	512	
0	0	0	0	0	0	1,232,552,866	0	0	0	0	0	
84,848,174	154,767,028	441,061,809	21,318,193	5,976,952	143,465,845	98,066,389	5,325,005	146,345,647	256,671	33,536	514	
54,845,088	112,559,623	364,496,310	60,348,977	0	105,263,310	140,551,584	15,158,380	119,003,908	260,785	38,953	6,434	
63,281,095	115,825,611	333,347,701	29,082,838	622,405	120,281,693	53,087,175	10,794,640	145,437,354	255,004	42,560	5,033	
0	0	0	0	0	0	940,504,000	0	0	0	0	0	
65,277,807	160,696,654	311,979,832	26,321,306	.....	21,640,541	20,209,843	12,686,466	175,937,507	253,139	48,469	676	
95,122,747	108,443,907	185,192,033	13,680,033	.....	38,250,763	163,467,373	3,633,946	85,760,224	145,605	21,074	275	
43,134,995	31,606,648	134,654,089	20,535,343	.....	57,275,260	151,917,720	14,246,522	80,198,619	95,994	17,102	3,398	
62,196,888	50,461,626	180,384,118	18,545,556	(A) 3,270,625	42,874,910	5,015,007	9,350,457	86,773,632	147,787	26,703	5,642	
29,293,887	26,381,911	49,275,253	4,440,330	.....	11,260,395	252,090,500	1,923,739	33,796,937	53,396	8,395	336	
42,275,070	29,728,244	195,411,363	7,197,005	.....	2,522,873	67,042,051	1,802,834	49,260,115	64,188	9,380	1,704	
43,505,113	44,112,494	164,904,183	10,265,845	.....	41,404,571	25,752,777	2,395,319	57,439,556	78,905	10,428	1,722	
30,715,083	20,413,747	134,850,007	9,470,778	.....	26,245,384	84,790,015	7,488,405	59,350,952	59,211	10,963	2,281	
45,287,143	24,069,333	103,287,441	18,290,796	(A) 5,089,027	.....	42,302,030	20,011,525	61,956,234	115,215	22,510	5,326	
43,986,035	81,760,071	105,576,772	20,118,772	7,907,474	.....	3,135,348	1,427,019	38,924,605	79,482	11,616	214	
30,526,245	18,522,472	36,340,653	9,428,398	(A) 6,375,740	2,160,337	117,536,220	4,884,998	45,233,166	(R) 65,304	12,551	3,570	
49,219,476	39,936,189	72,889,864	2,659,838	404,617	26,401,120	47,340,939	1,651,738	21,326,319	82,041	9,555	699	
0	0	0	0	0	0	197,950,608	.....	5,918,940	0	0	0	
0	80,699	14,088,960	76,729,580	0	86,000,725	0	.....	13,161,026	0	9	6	

Supplement to ELECTRICAL WORLD, May 6, 1933

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Table II—Detailed Data on Generator Rating, Output, Customers a of Public Utility Systems Having an Output Exceeding 100,000,0

59	Illinois Electric Power Company	2	79,400	0	0	203,869,548	203,869,548	0						
60	City of Detroit, Public Lighting Commission	1	80,000	0	0	190,060,990	172,740,000	17,320,990						

. 31, 1932		Generated and Purchased Output, 1932			Distribution of Output in Kilowatt-Hours, 1932							
dro Plants												
	Rating of Generators, Kw. (6)	Total Output, Kw.-Hr. (7)	Generated (Net), Kw.-Hr. (8)	Purchased, Kw.-Hr. (9)	Domestic Service (10)	Commercial, Small Light and Power (Retail) (11)	Commercial, Large Light and Power (Wholesale) (12)	Municipal Service (Street Lighting, etc.) (13)	Other Sales to Ultimate Consumers (14)	Electric Railway Operation (Including Company-Owned) (15)	Other Public Utilities (Including Municipal Systems) (16)	
	338,180	2,032,576,325	1,485,377,705	547,198,620	187,016,014	128,297,945	548,165,313	42,319,756	33,533,872	37,409,382	738,099,722	
(L)	50	1,048,824,142	709,424,807	339,399,335	179,941,658	188,930,393	271,652,579	32,233,778	.....	6,249,680	205,139,795	
	58,190	536,775,777	310,515,148	226,260,629	76,651,121	34,881,986	180,457,249	10,190,766	.....	44,332,140	95,038,903	
(L)	99,260	433,146,000	318,613,000	114,533,000	43,074,000	29,386,000	117,855,000	9,873,000	(c) 12,066,000	23,890,000	125,798,000	
	109,941	361,974,791	352,445,885	9,528,906	30,247,997	19,838,117	205,809,876	8,205,833	3,111,235	8,567,651	26,645,370	
	0	333,403,000	304,069,000	29,334,000	0	0	0	0	0	0	333,403,000	
	1,500	281,846,464	191,656,770	90,189,694	42,538,548	57,235,168	37,807,182	6,515,398	0	20,529,100	87,243,697	
	0	250,832,000	250,832,000	0	54,364,934	49,054,290	106,193,000	7,833,216	.....	.....	4,837,500	
	40,061	184,063,033	177,330,683	6,732,350	19,687,703	12,523,598	45,844,142	5,367,605	.....	7,499,263	63,279,336	
	1,750	179,572,365	4,374,539	175,197,826	14,844,709	15,577,611	103,112,675	3,163,199	(G) 405,171	0	20,171,697	
	0	153,982,440	153,982,440	0	11,834,295	7,792,101	89,538,219	4,037,532	.....	.....	23,067,058	
	25,812	142,240,346	118,242,146	23,998,200	20,717,740	18,080,237	53,389,155	4,797,808	791,500	14,426,302	6,818,600	
	9,600	139,285,039	44,984,149	94,300,890	12,974,549	6,339,766	20,113,935	1,698,264	.....	.....	91,972,578	
	30,935	91,388,626	91,344,826	43,800	(i) 13,277,014	(i, z)	(z) 55,893,637	1,347,994	.....	3,314,050	1,699,312	
	715,279	6,169,910,348	4,513,193,098	1,656,717,250	.....	.....	.....	.....	.....	.....	.....	
(L)	1,040,634	5,378,434,187	4,557,297,247	821,136,940	388,462,648	342,441,508	2,520,653,273	111,268,123	.....	153,735,835	1,068,027,252	
	0	4,981,200,000	4,957,300,000	23,900,000	690,300,000	901,400,000	1,826,800,000	204,000,000	.....	288,200,000	376,700,000	
	253,765	2,860,721,532	2,728,762,114	131,959,418	322,896,710	217,480,595	1,001,691,701	144,020,203	260,680	465,630,861	348,281,622	
	0	2,037,604,869	1,784,209,643	(g) 253,395,226	(b) 334,883,606	(z)	(z) 1,140,987,902	66,685,530	.....	174,140,608	1,698,880	
	56,465	1,457,715,339	1,431,340,339	26,375,000	144,639,333	95,596,397	912,449,029	21,832,554	.....	66,157,871	14,353,792	
	44,692	1,382,587,998	1,143,810,290	238,777,708	133,902,233	124,042,455	759,558,040	47,383,378	(G) 8,437,042	64,593,501	82,206,214	
	0	1,176,868,998	1,161,617,552	15,251,446	199,602,499	104,928,323	531,782,350	34,648,933	.....	183,328,749	3,759,776	
	223,000	933,430,500	931,730,100	1,700,400	0	0	0	0	(r) 763,700	0	875,390,700	
	22,198	664,678,386	424,302,568	240,375,818	61,971,084	42,504,131	252,552,245	11,480,115	.....	28,264,994	164,173,402	
	14,276	412,760,797	177,237,365	235,523,432	72,928,356	34,750,749	150,911,138	21,911,122	.....	4,072,922	68,994,350	
	48,000	370,582,826	333,086,260	37,496,566	44,499,855	27,886,816	177,274,482	6,181,375	.....	6,219,750	41,064,734	
	0	360,023,800	0	(t) 360,023,800	(o) 162,268,207	(o)	(o)	37,799,022	.....	.....	(u) 111,938,478	
	48,950	336,846,546	225,071,469	111,775,077	58,671,993	71,813,782	80,360,101	28,087,860	.....	29,857,399	2,665,652	
	24,100	324,958,106	87,931,700	237,026,406	31,244,449	29,239,090	37,009,548	10,784,887	.....	1,023,500	176,188,113	
	0	318,059,700	0	(t) 318,059,700	(o) 47,244,202	(o)	(o)	8,276,252	.....	.....	(e) 251,219,157	
	0	258,926,233	258,920,285	5,948	71,849,506	33,595,706	56,114,866	24,257,743	275,928	12,929,500	1,820,491	
	0	242,866,592	241,551,582	1,315,010	28,874,870	29,044,245	129,968,792	5,204,126	.....	19,793,932	1,892,715	
	4,420	212,223,069	211,245,876	977,193	26,676,482	14,137,713	104,179,370	3,220,668	.....	10,570,270	21,844,239	
	350	198,850,022	276,499,142	(y) —77,649,120	40,143,825	17,076,586	56,940,466	21,923,510	6,956,306	8,561,520	4,811,200	
	0	192,354,557	192,354,557	0	36,922,404	28,399,629	77,797,577	10,547,424	.....	452,300	1,260,220	
	0	132,689,604	0	132,689,604	19,393,085	14,957,793	74,587,259	3,140,078	.....	3,543,750	4,691,855	
	0	124,824,746	150,054,110	—25,229,364	13,271,596	6,325,066	75,799,009	2,631,231	.....	10,210,789	848,058	
	0	116,497,340	112,303,740	4,193,600	20,571,433	9,421,671	34,748,523	11,659,655	.....	22,556,046	2,964,800	
	1,780,850	24,475,705,747	21,386,625,939	3,089,079,808	.....	.....	.....	.....	.....	.....	.....	
	0	3,686,443,000	2,056,745,000	(l) 1,629,698,000	550,024,000	456,255,000	1,270,102,000	117,730,000	104,000	800,437,000	[See Col. (9)]	
	9,160	1,851,223,900	1,840,514,300	10,709,600	(k) 332,677,234	408,001,232	675,247,059	56,576,839	.....	59,602,645	64,369,380	
	1,350	1,399,680,283	1,345,401,334	54,278,949	83,146,152	84,244,647	376,218,624	13,733,179	23,655,378	8,597,426	682,586,792	
	4,100	1,331,986,990	622,579,552	709,407,438	150,780,565	83,754,549	252,358,741	80,366,525	.....	82,965,282	511,949,927	
	0	1,232,552,866	1,192,511,710	40,041,156	0	0	0	0	0	0	1,232,552,866	
	0	1,201,175,042	1,200,318,242	856,800	184,848,174	154,767,028	441,061,809	21,318,193	5,976,952	143,465,845	98,066,389	
	0	1,072,227,180	991,842,000	80,385,180	154,845,088	112,559,623	364,496,310	60,348,977	0	105,263,310	140,551,584	
	16,435	971,760,512	850,607,794	121,152,718	163,281,095	115,825,611	333,347,701	29,082,838	622,405	120,281,693	53,087,175	
	0	940,504,000	940,504,000	0	0	0	0	0	0	0	940,504,000	
	141,950	894,759,956	801,352,979	(g) 93,406,977	165,277,807	160,696,654	311,979,832	26,321,306	.....	21,640,541	20,209,843	
	2,175	693,551,026	611,311,550	82,239,476	95,122,747	108,443,907	185,192,033	13,680,033	.....	38,250,763	163,467,373	
	4,280	533,569,196	417,611,058	115,958,138	43,134,995	31,606,648	134,654,089	20,535,343	.....	57,275,260	151,917,720	
	3,590	458,872,819	83,572,163	375,300,656	62,196,888	50,461,626	180,384,118	18,545,556	(A) 3,270,625	42,874,910	5,015,007	
	22,244	408,462,952	209,792,152	198,670,800	29,293,887	26,381,911	49,275,253	4,440,330	.....	11,260,395	252,090,500	
	0	395,239,555	287,997,400	107,242,155	42,275,070	29,728,244	195,411,363	7,197,005	.....	2,522,873	67,042,051	
	6,800	389,779,858	225,435,151	164,344,707	43,505,113	44,112,494	164,904,183	10,265,845	.....	41,404,571	25,752,777	
(L)	17,145	373,324,371	332,654,602	40,669,769	30,715,083	20,413,747	134,850,007	9,470,778	.....	26,245,384	84,790,015	
	0	320,293,529	161,158,919	159,134,610	45,287,143	24,069,333	103,287,441	18,290,796	(A) 5,089,027	.....	42,302,030	
	0	302,836,096	244,121,612	58,714,484	43,986,035	81,760,071	105,576,772	20,118,772	7,907,474	.....	3,135,348	
	37,516	271,008,229	222,075,427	48,932,802	(R) 30,526,245	18,522,472	36,340,653	9,428,398	(A) 6,375,740	2,160,337	117,536,220	
	0	261,830,100	261,830,100	0	49,219,476	39,936,189	72,889,864	2,659,838	404,617	26,401,120	47,340,939	
	0	203,869,548	203,869,548	0	0	0	0	0	0	0	197,950,608	
49	Public Service Company of Indiana	8	(L) 119,980	2	4,280	533,569,196	417,611,058	115,958,138	43,134			
50	Illinois Power & Light Corporation (Illinois)	17		1								

s and Distribution of Energy
,000 Kw.-Hr. During 1932

This tabulation is based on the operating company as the unit. Group statistics are given in a few instances for properties which, though distinct corporate entities, are operated in each case as a single physical system.

	Used by Company (17)	Not Accounted for (Losses) (18)	Number of Customers, Dec. 31, 1932: Domestic (19)	Commercial Small Light and Power (Retail) (20)	Commercial Large Light and Power (Wholesale) (21)	Municipal Service (Street Lighting, etc.) (22)	Other Sales to Ultimate Consumers (23)	Electric Railway Operation (24)	Other Public Utilities (Including Municipal Systems) (25)	Line No. (26)
722	38,776,164	278,958,157	407,819	61,883	12,136	151	11	.....	75	1
795	5,065,253	159,611,006	(a) 306,748	(a) 70,250	(a) 529	(a) 40	.....	(a) 1	(a) 10	2
903	20,710,143	74,513,469	120,697	16,957	2,824	80	.....	3	17	3
000	5,675,000	65,529,000	71,794	11,776	2,845	47	(c)	4	10	4
370	7,537,109	52,011,603	62,322	10,961	1,907	973	.....	2	9	5
000	0	(d)	0	0	0	0	0	0	4	6
597	2,311,450	27,665,921	59,606	9,502	69	28	0	1	5	7
500	3,643,668	24,905,392	101,097	14,163	3,645	.....	.....	.....	.....	8
336	3,352,491	26,508,895	43,305	7,295	1,723	516	.....	4	24	9
597	554,222	21,743,081	39,225	5,862	416	7	(G) 282	0	4	10
058	2,502,572	15,210,663	32,786	4,912	986	252	.....	.....	1	11
600	3,048,454	20,170,550	38,713	6,565	1,763	357	1	1	.....	12
578	896,868	5,289,079	(h) 18,474	(h) 2,982	(h) 879	(h) 14	.....	.....	(h) 6	13
312	455,902	15,400,717	(i) 24,384	(i, z)	(z) 4,318	58	.....	1	6	14
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
252	55,460,932	738,384,616	550,004	82,903	4,399	944	.....	17	76	15
900	.....	(n) 693,800,000	(a) 1,567,199	(a) 379,241	(a) 14,229	(a) 1,512	.....	8	3	16
622	29,499,042	330,960,118	513,610	89,872	19,312	1,037	248	9	21	17
380	18,581,706	300,626,637	(o) 846,883	(o)	(o)	218	.....	6	3	18
792	.....	202,686,363	233,920	40,871	6,610	454	.....	38	25	19
214	5,914,532	156,550,603	276,594	51,376	4,337	2,885	(G) 9,671	15	37	20
776	3,562,297	115,256,071	266,623	29,709	1,915	182	.....	1	3	21
700	.....	57,276,100	0	0	0	0	(r)	0	6	22
802	9,786,228	93,946,187	120,974	21,606	3,836	716	.....	5	13	23
850	3,151,590	56,040,570	122,925	19,010	4,129	1,505	.....	3	35	24
734	1,491,017	65,964,797	90,350	13,673	2,836	875	.....	2	14	25
478	2,835,900	45,182,193	(h,v) 140,046	(v)	(v)	(v)	.....	.....	(v)	26
652	20,385,214	45,004,545	104,836	12,363	933	985	.....	9	8	27
113	3,517,123	35,951,396	51,214	12,862	106	216	.....	1	13	28
57	682,040	10,638,049	(h,v) 39,912	(v)	(v)	(v)	.....	.....	(v)	29
491	6,534,174	51,548,319	120,248	17,336	6,708	126	.....	.....	2	30
715	4,695,963	23,391,949	64,862	10,815	196	463	.....	2	5	31
239	1,911,994	29,682,333	48,165	6,237	1,630	84	.....	2	12	32
200	5,523,514	36,913,095	69,465	11,144	1,365	867	8,984	1	4	33
220	1,832,338	35,142,665	68,211	14,025	2,132	156	.....	1	2	34
855	742,480	11,633,304	34,486	4,495	98	34	.....	2	7	35
058	1,519,443	14,219,554	31,352	3,116	857	26	.....	2	2	36
800	1,054,373	13,520,839	36,456	5,046	828	207	.....	2	1	37
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	...
9)]	18,628,000	473,163,000	(B) 759,675	125,509	3,119	4	20	5	.....	38
880	26,459,700	228,289,811	(k) 450,603	77,761	432	181	.....	4	2	39
792	4,657,167	122,840,918	169,269	32,427	423	176	1,883	7	56	40
927	13,039,066	156,772,335	235,068	32,707	512	2,373	.....	8	11	41
866	0	0	0	0	0	0	0	0	4	42
389	5,325,005	146,345,647	256,671	33,536	514	126	319	3	5	43
584	15,158,380	119,003,908	260,785	38,953	6,434	1,906	0	14	11	44
175	10,794,640	145,437,354	255,004	42,560	5,033	305	98	3	18	45
000	0	0	0	0	0	0	0	0	2	46
843	12,686,466	175,937,507	253,139	48,469	676	268	.....	5	12	47
373	3,633,946	85,760,224	145,605	21,074	275	65	.....	9	17	48
720	14,246,522	80,198,619	95,994	17,102	3,398	1,454	.....	12	31	49
007	9,350,457	86,773,632	147,787	26,703	5,642	747	(A) 3,510	.....	24	50
500	1,923,739	33,796,937	53,396	8,395	336	33	.....	18	12	51
051	1,802,834	49,260,115	64,188	9,380	1,704	28	.....	(E)	13	52
777	2,395,319	57,439,556	78,905	10,428	1,722	25	.....	6	14	53
015	7,488,405	59,350,952	59,211	10,963	2,281	248	.....	3	19	54
030	20,011,525	61,956,234	115,215	22,510	5,326	1,679	(A) 6,925	.....	13	55
348	1,427,019	38,924,605	79,482	11,616	214	9	11,651	.....	1	56
220	4,884,998	45,233,166	(R) 65,304	12,551	3,570	258	(A) 8,985	0	48	57
939	1,651,738	21,326,319	82,041	9,555	699	185	.....	1	5	58
608	.....	5,918,940	0	0	0	0	0	0	3	59
0		13,161,026	0	0	6		0	1	0	60
,122,247		188,449,907	185,192,033	15,080,033	.....		38,250,763	163,467,373	3,633,946	85,760,224	145,605	21,074	275
,134,995	31,606,648	134,654,089	20,535,343	.....			57,275,260	151,917,720	14,246,522	80,198,619	95,994	17,102	3,398
,196,888	50,461,626	180,384,118	18,545,556	(A) 3,270,625			42,874,910	5,015,007	9,350,457	86,773,632	147,787	26,703	5,642

(a) Bills rendered in December.

(b) Residence rate.

(c) Electricity exchanged for water power.

(d) All energy sold at low-tension bus of generating station.

(e) Includes 250,412,355 kw.-hr. transferred to associated companies.

(f) Includes about 11,000 kw. for station auxiliary use; net 204,000 kw.

(g) Net.

(h) Customers' meters.

(i) Commercial light combined with domestic service.

(j) Canadian Niagara Power Co., Ltd. (see Canada), included in Niagara Hudson Power Corp. system; also St. Lawrence Power Co., Ltd., one hydro plant, 2,000 kw., generated 13,464,272 kw.-hr. (Canada).

(k) Includes farm service.

(l) Includes New York Edison Co., Brooklyn Edison Co., Inc., New York & Queens Electric Light & Power Co., and United Electric Light & Power Co.

(m) Ohio Electric Power Co., Columbus, Delaware & Marion Electric Co., Reserve Power & Light Co., and smaller properties.

(n) Energy used by company included with losses.

(o) Commercial, small light and power (retail) and commercial, large light and power (wholesale) combined with domestic service.

(p) Also one plant, 5,000 kw., operated by purchased steam.

(q) Metropolitan Edison Co., and New Jersey Power & Light Co.

(r) Energy sold to Arundel Corp. at Safe Harbor, Pa., for construction.

(s) Pennsylvania Electric Co., Erie Lighting Co., Clarion River Power Co. and Youghiogheny Hydro-Electric Corp.

(t) Kw.-hr. transferred from associated companies.

(u) Includes 109,870,698 kw.-hr. transferred to associated companies.

(v) Customers of all classes included under domestic.

(w) Includes company's share of jointly owned plant (Stanton).

(x) Includes company's share of jointly owned plant (Deepwater).

(y) Includes as credit 81,824,000 kw.-hr.

(L)	17,145	373,324,371	332,654,602	40,669,769		45,287,143	24,069,333	103,287,441	18,290,796	(A)	5,089,027			42,302,030
	0	320,293,529	161,158,919	159,134,610		43,986,035	81,760,071	105,576,772	20,118,772		7,907,474			3,135,348
	0	302,836,096	244,121,612	58,714,484		30,526,245	18,522,472	36,340,653	9,428,398	(A)	6,375,740	2,160,337		117,536,220
	37,516	271,008,229	222,075,427	48,932,802	(R)	49,219,476	39,936,189	72,889,864	2,659,838		404,617	26,401,120		47,340,939
	0	261,830,100	261,830,100	0		0	0	0	0		0	0		197,950,608
	0	203,869,548	203,869,548	0		0	80,699	14,088,960	76,729,580		0	86,000,725		0

49	Public Service Company of Indiana	8	(L)	119,980	2	4,280	533,569,196	417,611,058	115,958,138			43,13
50	Illinois Power & Light Corporation (Illinois)	17		82,110	1	3,590	458,872,819	83,572,163	375,300,656			62,19
51	Indiana & Michigan Electric Company	2		93,500	5	22,244	408,462,952	209,792,152	198,670,800			29,29
52	Ohio Public Service Company	8		130,100	0	0	395,239,555	287,997,400	107,242,155			42,27
53	Toledo Edison Company	3		160,200	2	6,800	389,779,858	225,435,151	164,344,707			43,50
54	Northern Indiana Public Service Company	5		102,787	9	(L) 17,145	373,324,371	332,654,602	40,669,769			30,71
55	Central Illinois Public Service Company	8		84,280	0	0	320,293,529	161,158,919	159,134,610			45,28
56	Indianapolis Power & Light Company	4		163,200	0	0	302,836,096	244,121,612	58,714,484			43,98
57	Wisconsin Power & Light Company	7		54,384	36	37,516	271,008,229	222,075,427	48,932,802	(R)	30,526,245	30,52
58	The Columbus Railway, Power & Light Company	2		132,500	0	0	261,830,100	261,830,100	0			49,21
59	Illinois Electric Power Company	2		79,400	0	0	203,869,548	203,869,548	0			
60	City of Detroit, Public Lighting Commission	1		80,000	0	0	190,060,990	172,740,000	17,320,990			
61	City of Cleveland, Dept. of Public Utilities	1		50,000	0	0	165,392,410	165,392,410	0			24,75
62	Wisconsin Public Service Corporation and Subsidiary	3		39,750	9	29,620	161,601,100	159,229,020	2,372,080			17,98
63	Central Illinois Light Company	0		0	0	0	131,320,248	0	131,320,248			20,89
64	Northern Indiana Power Company	6		24,900	1	384	130,816,594	2,111,745	128,704,849			16,11
65	Indiana General Service Company	3		40,950	0	0	126,841,303	5,299,179	121,542,124			16,14
66	Indiana Service Corporation	1		31,000	0	0	123,467,451	56,776,500	66,690,951			10,12
67	Moline-Rock Island Manufacturing Company	2		78,200	0	0	116,424,946	82,897,995	33,526,951			
68	Ohio Electric Power Company Group (m)	1		24,500	0	0	110,185,257	37,638,500	72,546,757			
69	Western United Gas & Electric Company	2		41,325	1	125	109,398,945	76,407,100	32,991,845	(R)	18,98	
70	Wisconsin Valley Electric Company	2		3,250	9	15,592	103,954,670	61,742,440	42,212,230			11,11
	Totals for section	160		6,636,735	137	312,466	20,664,414,922	15,924,041,482	4,740,373,440			
	West North Central States											
71	The North American Co. Sys. (Mo., Ill. and Iowa Group)	7		457,170	2	264,000	1,650,408,229	1,650,388,434	19,795			190,43
72	Northern States Power Company (Del.) Subsidiaries	24		291,016	27	146,735	974,484,310	919,630,123	54,854,187			172,76
73	Kansas City Power & Light Company	(F) 5	(F)	258,537	0	0	615,730,828	613,098,645	2,632,183			77,64
74	Minnesota Power & Light Company	4		30,300	11	94,911	336,451,669	335,895,169	556,500	(k)	23,65	
75	Nebraska Power Company	1		98,000	0	0	313,610,700	313,610,700	0			38,52
76	Kansas Gas & Electric Company	2		70,000	0	0	235,850,500	235,806,000	44,500			30,71
77	Des Moines Electric Light Company	3		91,940	1	800	177,656,470	177,656,470	0			25,97
78	Empire District Electric Company	(H) 2	(H)	67,600	4	19,600	155,431,973	151,927,780	3,504,193			7,87
79	Sioux City Gas & Electric Co., Iowa Pub. Serv. Co. System	19		70,707	4	2,025	153,647,061	142,377,420	11,269,641			26,78
80	The Kansas Power & Light Company	5		74,725	0	0	147,425,196	141,653,953	5,771,243			13,97
81	Interstate Power Company (Del.) and Subsidiaries	15		62,661	12	6,805	137,742,749	137,742,749	0			27,75
82	Iowa Electric Light & Power Company	14		61,818	2	1,460	125,997,054	125,204,932	792,122			28,27
83	The United Power & Light Corporation (of Kansas)	11		44,335	5	3,895	114,104,546	96,535,043	17,569,503			15,02
	Totals for section	112		1,678,809	68	540,231	5,138,541,285	5,041,527,418	97,013,867			
	South Atlantic States											
84	Duke Power Company	9	(L)	306,725	41	(L) 598,730	1,649,582,952	1,320,485,073	329,097,879			(K
85	Georgia Power Company	15	(C)	89,536	23	(C) 287,087	1,163,107,611	1,085,048,521	(g) 78,059,090			91,27
86	Appalachian Electric Power Company (O)	11		340,575	5	44,900	1,135,486,426	919,384,358	216,102,068			61,23
87	Consolidated Gas Electric Light & Power Co. of Baltimore	3		257,000	0	0	843,522,718	234,117,024	609,405,694			143,32
88	Carolina Power & Light Company	4		46,750	10	205,450	814,270,505	618,891,920	195,378,585			32,82
89	The North American Co. System (District of Columbia Group)	1		208,000	0	0	542,527,569	542,527,569	0			106,65
90	Virginia Electric & Power Company	8		127,949	9	28,950	507,496,464	363,148,084	144,348,380			65,50
91	Assoc. Gas & Elec. System (South Carolina Group) (Q)	2		78,000	4	154,705	397,764,719	365,767,325	31,997,394			6,45
92	Virginia Public Service Company	6		67,926	13	(L) 15,326	219,240,422	198,521,007	20,719,415			46,19
93	Florida Power & Light Company	(M) 38		139,840	0	0	197,622,270	193,112,890	4,509,380			44,49
94	Tampa Electric Company	2		36,500	1	600	127,731,492	120,062,231	7,669,261			12,82
95	Delaware Power & Light Company	(ll) 1	(ll)	22,500	0	0	119,849,982	0	119,849,982			16,62
96	Florida Power Corporation and Subsidiaries	8		44,224	2	13,800	98,446,191	97,491,321	954,870			10,48
97	South Carolina Power Company	6		20,032	2	16,275	89,262,093	88,675,109	(g) 586,984			10,16
98	Wheeling Electric Company	2		9,360	0	0	86,783,762	0	86,783,762			13,93
	Totals for section	116		1,794,917	110	1,365,823	7,992,695,176	6,147,232,432	1,845,462,744			
	East South Central States											
99	Alabama Power Company	13	(C)	156,417	6	(C) 398,300	1,406,939,956	1,190,639,706	(g) 216,300,250			62,39
100	The Tennessee Electric Power Company	15	(L)	109,382	14	133,123	536,913,727	468,253,247	(g) 68,660,480			53,30
101	Louisville Gas & Electric Company (Del.) Subsidiaries	3		112,020	1	80,320	410,323,910	346,553,310	63,770,600			42,64
102	U. S. Government (Muscle Shoals)	0		0	1	184,000	286,638,000	286,638,000	0			
103	Kentucky Utilities Company	16		53,480	2	24,540	251,322,584	212,724,544	38,598,040			16,57
104	Birmingham Electric Company	1		11,700	0	0	198,282,094	0	198,282,094			24,03
105	Memphis Power & Light Company	1		54,000	0	0	172,532,740	172,531,300	1,440			23,20
106	Mississippi Power & Light Company	43		20,398	0	0	132,226,989	4,400,422	127,826,567			15,23
107	Mississippi Power Company	26		25,572	0	0	103,725,735	18,767,679	(g) 84,958,056			16,14
108	Tennessee Public Service Company	1		6,125	1	150	93,796,831	491,480	93,305,351			12,38
	Totals for section	119		549,094	25	820,433	3,592,702,566	2,700,999,688	891,702,878			
	West South Central States											
109	Louisiana Power & Light Company	15		90,122	0	0	551,155,000	485,116,000	66,039,000			8,78
110	Texas Electric Service Company	12		102,069	0	0	452,534,000	449,224,000	3,310,000			32,13
111	Houston Lighting & Power Company	7		187,681	0	0	435,971,000	399,117,000	36,854,000			45,22
112	Texas Power & Light Company	15	(L)	99,226	4	885	435,440,000	311,895,000	123,545,000			40,62
113	Oklahoma Gas & Electric Company	17		184,520	0	0	430,351,857	405,132,309	25,219,548			50,02
114	Arkansas Power & Light Company	40	(L)	38,000	3	(L) 65,666	301,055,000	107,933,000	193,122,000			21,47
115	New Orleans Public Service Inc.	3		112,700	0	0	297,521,000	297,521,000	0			32,37
116	Gulf States Utilities Company	13		77,770	0	0	223,004,239	116,839,439	106,164,800			18,16
117	Central Power & Light Company	10		53,226	5	15,000	220,637,696	177,892,334	42,745,362			20,71
118	Dallas Power & Light Company	1		82,500	0	0	209,154,642	207,265,500	1,889,142			33,87
119	Southwestern Gas & Electric Company	14		45,700	0	0	194,055,928	120,449,631	73,606,297			20,51
120	Public Service Company of Oklahoma	(U) 14	(U)	79,320	0	0	186,934,051	156,441,285	30,492,766			27,27
121	West Texas Utilities Company	22		53,918	0	0	186,102,888	181,761,547	4,341,341			17,23
122	San Antonio Public Service Company	2		99,050	2	790	172,707,153	129,399,625	43,307,528			24,25
123	El Paso Electric Company (and Affiliates)	3		59,864	0	0	89,443,680	89,443,680	0			8,76
	Totals for section	188		1,365,666	14	82,341	4,386,068,134	3,635,431,350	750,636,784			
	Mountain States											
124	The Montana Power Company	2		900	11	293,400	613,026,278	605,932,000	7,094,278			37,22
125	Utah Power & Light Company	5	(l)	12,240	23	233,773	333,331,026	311,311,550	82,239,476			95,12

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	Mountain States													
124	The Montana Power Company		2	900	11	293,400	613,026,278	605,932,000		7,094,278		37,2		
125	Utah Power & Light Company													
	2,175	693,551,026	611,311,550	82,239,476		95,122,747	108,443,907	185,192,033	13,680,033			38,250,763	163,467,373	
	4,280	533,569,196	417,611,058	115,958,138		43,134,995	31,606,648	134,654,089	20,535,343			57,275,260	151,917,720	
	3,590	458,872,819	83,572,163	375,300,656		62,196,888	50,461,626	180,384,118	18,545,556	(A)	3,270,625	42,874,910	5,015,007	
	22,244	408,462,952	209,792,152	198,670,800		29,293,887	26,381,911	49,275,253	4,440,330			11,260,395	252,090,500	
	0	395,239,555	287,997,400	107,242,155		42,275,070	29,728,244	195,411,363	7,197,005			2,522,873	67,042,051	
	6,800	389,779,858	225,435,151	164,344,707		43,505,113	44,112,494	164,904,183	10,265,845			41,404,571	25,752,777	
(L)	17,145	373,324,371	332,654,602	40,669,769		30,715,083	20,413,747	134,850,007	9,470,778			26,245,384	84,790,015	
	0	320,293,529	161,158,919	159,134,610		45,287,143	24,069,333	103,287,441	18,290,796	(A)	5,089,027		42,302,030	
	0	302,836,096	244,121,612	58,714,484		43,986,035	81,760,071	105,576,772	20,118,772		7,907,474		3,135,348	
	37,516	271,008,229	222,075,427	48,932,802	(R)	30,526,245	18,522,472	36,340,653	9,428,398	(A)	6,375,740	2,160,337	117,536,220	
	0	261,830,100	261,830,100	0		49,219,476	39,936,189	72,889,864	2,659,838		404,617	26,401,120	47,340,939	
	0	203,869,548	203,869,548	0		0	0	0	0		0	0	197,950,608	
	0	190,060,990	172,740,000	17,320,990		0	80,699	14,088,960	76,729,580		0	86,000,725	0	
	0	165,392,410	165,392,410	0		24,750,063	18,782,361	47,819,742	31,293,562				8,160,151	
	29,620	161,601,100	159,229,020	2,372,080		17,988,690	14,211,023	58,580,757	5,380,463				36,427,901	
	0	131,320,248	0	131,320,248		20,899,037	26,874,803	62,414,851	4,905,745			204,050	3,220,633	
	384	130,816,594	2,111,745	128,704,849		16,111,521	10,547,982	48,883,941	5,269,949			283,950	16,379,124	
	0	126,841,303	5,299,179	121,542,124		16,145,172	19,029,929	67,973,087	4,095,602				1,578,266	
	0	123,467,451	56,776,500	66,690,951		10,121,335	11,810,609	48,050,707	2,291,837			5,134,394	19,037,613	
	0	116,424,946	82,897,995	33,526,951		0	0	0	0		105,120	13,652,812	101,411,774	
	0	110,185,257	37,638,500	72,546,757										
	125	109,398,945	76,407,100	32,991,845	(R)	18,988,281	23,224,976	12,851,588	2,165,312		2,175,182	6,119,701	24,296,690	
	15,592	103,954,670	61,742,440	42,212,230		11,117,429	7,837,220	50,058,994	1,881,873		960,663	2,163,255	16,600,800	
	312,466	20,664,414,922	15,924,041,482	4,740,373,440										
	264,000	1,650,408,229	1,650,388,434	19,795		190,430,348	235,272,447	489,091,888	37,475,205			158,148,398	285,247,703	
	146,735	974,484,310	919,630,123	54,854,187		172,768,683	155,255,072	324,972,878	36,729,103		41,383,995	2,625,062	56,566,057	
	0	615,730,828	613,098,645	2,632,183		77,640,726	129,949,423	181,727,748	33,749,955			95,569,729	25,399,354	
	94,911	336,451,669	335,895,169	556,500	(k)	23,656,987	30,454,940	167,006,348	3,152,225			14,068,077	44,389,208	
	0	313,610,700	313,610,700	0		38,525,060	62,022,557	104,615,905	6,872,289		1,426,928	28,691,100	45,208,855	
	0	235,850,500	235,806,000	44,500		30,719,166	38,460,520	112,732,972	2,642,800			4,986,921	10,336,650	
	800	177,656,470	177,656,470	0		25,979,969	10,943,928	74,644,609	9,243,703	(A)	1,092,031		30,714,900	
	19,600	155,431,973	151,927,780	3,504,193		7,878,351	8,721,597	48,445,088	1,617,485			4,298,885	49,854,359	
	2,025	153,647,061	142,377,420	11,269,641		26,786,472	20,469,029	49,571,736	11,792,963	(J)	5,281,826	3,695,731	6,953,027	
	0	147,425,196	141,653,953	5,771,243		13,973,143	13,890,792	25,562,060	4,468,726	(A)	1,035,836	1,499,954	68,872,248	
	6,805	137,742,749	137,742,749	0		27,755,410	29,381,567	14,567,473	10,201,452		6,267,860		12,875,535	
	1,460	125,997,054	125,204,932	792,122		28,273,819	4,422,262	47,788,747	2,500,515	(A)	1,853,327	6,503,708	16,321,050	
	3,895	114,104,546	96,535,043	17,569,503		15,021,688	10,800,278	50,145,598	2,518,560	(A)	946,297	336,100	10,902,814	
	540,231	5,138,541,285	5,041,527,418	97,013,867										
(L)	598,730	1,649,582,952	1,320,485,073	329,097,879		(K)	(K)	1,337,735,087	(K)		(K)	(K)	(K)	
(C)	287,087	1,163,107,611	1,085,048,521	78,059,090	(g)	91,270,310	132,820,108	552,640,492	15,976,073			51,078,512	50,096,767	
	44,900	1,135,486,426	919,384,358	216,102,068		61,232,500	81,246,201	768,242,777	6,493,969		3,061,469	22,922,016	62,536,750	
	0	843,522,718	234,117,024	609,405,694		143,322,553	95,237,283	374,957,184	15,899,090			129,237,937		
	205,450	814,270,505	618,891,920	195,378,585		32,822,142	24,639,927	223,081,977	(P) 31,423,798		0	4,174,920	(P)357,376,271	
	0	542,527,569	542,527,569	0		106,659,823	135,940,889	115,846,529	23,169,534			67,845,626	634,510	
	28,950	507,496,464	363,148,084	144,348,380		65,509,122	90,078,381	214,718,104	4,214,294		9,641,300	31,982,180	21,671,952	
	154,705	397,764,719	365,767,225	31,997,394		6,458,056	6,459,707	81,610,393	2,976,389			926,790	267,288,480	
(L)	15,326	219,240,422	198,521,007	20,719,415		46,191,964	25,121,540	77,633,957	4,702,897			7,310,254	14,547,708	
	0	197,622,270	193,112,820	4,509,380		44,492,198	42,878,605	27,093,170	17,699,903	(G)	3,729,960	3,452,100	226,348	(G)
	600	127,731,492	120,062,231	7,669,261		12,820,279	14,768,003	66,807,127	3,517,744	(G)	960,191	6,723,995	1,535,480	(G)
	0	119,849,982	0	119,849,982		16,622,066	20,684,046	50,065,143	2,039,008			12,016,573	6,890,017	
	13,800	98,446,191	97,491,321	954,870		10,484,660	9,415,335	15,830,006	1,957,202	(A)	657,243		37,799,582	
	16,275	89,262,093	88,675,109	586,984	(g)	10,169,114	10,665,267	45,539,423	2,019,179			2,326,807	729,200	
	0	86,783,762	0	86,783,762		13,935,586	21,883,834	32,657,186	1,081,871		63,361	3,056,155		
	1,365,823	7,992,695,176	6,147,232,432	1,845,462,744										
(C)	398,300	1,406,939,956	1,190,639,706	216,300,250	(g)	62,391,493	58,599,282	649,725,214	6,670,012			6,693,102	387,122,111	(g)
	133,123	536,913,727	468,253,247	68,660,480	(g)	53,305,755	54,905,079	234,721,302	4,389,793			31,103,401	14,000,275	
	80,320	410,323,910	346,553,310	63,770,600		42,647,261	41,524,564	96,660,499	20,666,721			41,235,021	126,650,620	
	184,000	286,638,000	286,638,000	0		0	0	0	0		0	0	820,619,000	
	24,540	251,322,584	212,724,544	38,598,040		16,572,391	15,276,267	82,250,071	6,160,055	(A)	1,875,224	233,891	92,015,153	
	0	198,282,094	0	198,282,094		24,032,487	37,023,773	70,074,220	5,724,328	(G)	186,868	34,673,994		
	0	172,532,740	172,531,300	1,440		23,208,931	43,639,111	34,520,348	8,817,305			25,955,272	12,058,840	
	0	132,226,989	4,400,422	127,826,567		15,235,922	17,196,294	50,624,810	14,030,829		1,512,154	1,578,994	228,160	
	0	103,725,735	18,767,679	84,958,056	(g)	16,145,256	23,281,538	37,181,539	2,912,889			857,156	1,889,100	
	150	93,796,831	491,480	93,305,351		12,383,408	14,160,338	44,283,375	3,122,210		0	7,070,747	1,160,897	
	820,433	3,592,702,566	2,700,999,688	891,702,878										
	0	551,155,000	485,116,000	66,039,000		8,789,492	6,969,637	173,969,718	3,781,112		1,214,874		316,794,983	
	0	452,534,000	449,224,000	3,310,000		32,131,000	46,566,000	155,665,000	19,869,000		555,000	13,548,000	119,311,000	
	0	435,971,000	399,117,000	36,854,000		45,227,092	82,337,337	186,827,844	31,426,315	(G)	4,489,119	24,366,673	9,020,276	
	885	435,440,000	311,895,000	123,545,000		40,629,611	42,606,055	156,461,652	25,443,869	(G)	2,011,305	17,223,789	68,154,257	
	0	430,351,857	405,132,309	25,219,548		50,028,297	52,056,869	203,842,117	26,609,550			17,399,272	12,266,471	
(L)	65,666	301,055,000	107,933,000	193,122,000		21,473,900	25,425,729	125,871,706	7,968,782		927,877	13,730,888	28,883,192	
	0	297,521,000	297,521,000	0		32,378,359	32,174,402	89,048,559	17,372,873			40,303,720	(S) 52,345,858	
	0	223,004,239	116,839,439	106,164,800		18,161,009	20,825,510	107,779,262	5,239,126		6,556,801	1,974,737	16,684,576	
	15,000	220,637,696	177,892,334	42,745,362		20,713,010	36,783,829	72,460,652	5,568,704		734,370	576,190	7,304,848	
	0	209,154,642	207,265,500	1,889,142		33,871,413	70,558,771	27,874,009	23,634,698	(G)	145,706	28,869,689	1,855,532	
	0	194,055,928	120,449,631	73,606,297		20,513,760	24,024,127	88,174,361	7,432,211			6,606,550	14,235,992	
	0	186,934,051	156,441,285	30,492,766		27,279,837	14,773,278	87,982,549	8,014,565			3,520,397	14,109,240	
	0	186,102,888	181,761,547	4,341,341		17,239,210	14,003,978	51,573,087	5,282,743	(A)	1,047,628	37,006	50,400,206	
	790	172,707,153	129,399,625	43,307,528		24,258,947	58,841,916	32,079,788	1,959,664			6,308,811	16,388,544	
	0	89,443,680	89,443,680	0		8,766,388	19,134,154	30,077,103	1,559,170	(G)	864,166	5,807,230	9,038,844	

37,225,960	37,345,647	340,825,743	8,113,718	2,558,782	54,296,448	8,673,500		123,986,480	50,313	10,617	214	
73	3,633,946	85,760,224	145,605	21,074	275	65	.....	9	17	48		
20	14,246,522	80,198,619	95,994	17,102	3,398	1,454	.....	12	31	49		
07	9,350,457	86,773,632	147,787	26,703	5,642	747	(A) 3,510	.....	24	50		
00	1,923,739	33,796,937	53,396	8,395	336	33	.....	18	12	51		
51	1,802,834	49,260,115	64,188	9,380	1,704	28	.....	(E)	13	52		
77	2,395,319	57,439,556	78,905	10,428	1,722	25	.....	6	14	53		
15	7,488,405	59,350,952	59,211	10,963	2,281	248	.....	3	19	54		
30	20,011,525	61,956,234	115,215	22,510	5,326	1,679	(A) 6,925	.....	13	55		
48	1,427,019	38,924,605	79,482	11,616	214	9	11,651	.....	1	56		
20	4,884,998	45,233,166	(R) 65,304	12,551	3,570	258	(A) 8,985	0	48	57		
39	1,651,738	21,326,319	82,041	9,555	699	185	.....	1	5	58		
08	.....	5,918,940	0	0	0	0	0	0	3	59		
0	.....	13,161,026	0	9	6	.....	0	1	0	60		
51	13,921,910	20,664,621	38,865	6,296	381	.....	.....	.....	143	61		
01	3,632,531	25,379,735	35,822	7,112	1,680	82	.....	.....	9	62		
33	409,697	12,391,432	34,015	7,234	166	25	.....	1	4	63		
24	3,755,459	29,584,668	39,352	7,623	1,567	715	.....	1	21	64		
66	1,007,669	17,011,578	29,137	4,658	109	19	.....	.....	5	65		
13	18,401,931	8,619,025	19,421	2,870	1,157	227	.....	1	8	66		
74	5,040	1,250,200	0	0	0	0	1	3	3	67		
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	68		
90	4,647,251	14,929,964	(h, R) 33,636	(h) 5,668	(h) 82	(h) 14	(h) 111	(h) 1	(h) 6	69		
00	672,951	12,661,485	20,906	4,156	1,018	31	67	1	8	70		
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
03	7,528,382	247,213,858	270,957	40,158	339	41	.....	3	20	71		
57	10,088,684	174,094,776	292,534	47,378	20,468	334	413	2	73	72		
54	6,711,032	64,982,861	115,466	23,827	155	444	.....	3	12	73		
08	1,517,343	52,206,541	(k) 35,872	6,609	395	66	.....	1	23	74		
55	.....	26,248,006	55,111	8,071	219	39	1,014	1	2	75		
50	822,437	35,149,034	50,794	8,066	622	48	.....	8	17	76		
00	1,318,524	23,718,806	42,218	5,835	2,372	216	(A) 1,385	.....	4	77		
59	655,896	33,960,312	17,906	4,906	1,341	51	.....	2	9	78		
27	2,898,032	26,198,245	57,497	11,828	3,677	292	(J) 4,632	1	29	79		
48	1,583,349	16,539,088	26,220	5,201	811	116	(A) 845	.....	14	80		
35	9,601,541	27,091,911	59,401	18,192	52	488	1	.....	44	81		
50	1,738,654	16,594,972	43,222	1,664	326	85	(A) 2,248	3	24	82		
14	3,028,714	20,404,497	27,937	6,747	2,011	120	(A) 900	.....	23	83		
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
	55,155,749	256,692,116	(K)	(K)	585	(K)	(K)	(K)	(K)	84		
67	(N) 8,548,887	260,676,462	111 727	33,332	405	421	.....	1	43	85		
50	5,066,080	124,684,664	103,604	24,121	628	184	554	8	27	86		
...	10,574,016	74,294,655	196,956	24,896	314	16	.....	1	.....	87		
71	1,236,521	139,514,949	48,189	13,140	922	(P) 961	0	.....	(P) 8	88		
10	5,043,990	87,386,668	133,016	18,728	126	36	.....	4	1	89		
52	5,641,377	64,039,754	93,761	18,950	805	81	2,340	5	14	90		
80	3,833,959	28,210,945	11,321	3,080	443	80	.....	1	7	91		
08	5,429,327	38,302,775	58,505	11,409	2,150	106	.....	3	8	92		
48	(N) 11,316,929	46,733,057	61,184	15,318	839	1,172	(G) 1,118	2	1	93		
80	(N) 2,255,155	18,343,518	26,821	5,619	62	109	(G) 885	.....	2	94		
17	855,656	10,677,473	28,466	5,602	196	21	.....	1	3	95		
82	1,190,899	21,111,264	19,486	5,284	173	120	(A) 597	.....	14	96		
00	445,771	17,367,332	15,138	5,264	85	46	.....	(E)	3	97		
...	664,419	13,441,350	23,489	4,803	50	26	43	2	.....	98		
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
11	(N) 3,954,145	231,784,597	74,611	22,987	537	164	.....	(E)	51	99		
75	6,148,197	138,339,925	88,838	21,630	838	91	.....	1	6	100		
20	2,283,987	38,655,237	74,443	11,037	3,644	355	.....	1	4	101		
00	6,019,000	0	0	0	0	0	0	0	1	102		
53	4,730,212	32,209,320	40,976	10,811	2,018	298	(A) 3,259	1	22	103		
...	1,087,534	25,478,890	43,511	6,954	322	256	(G) 37	.....	.....	104		
40	1,221,314	23,111,619	37,052	9,159	195	151	.....	1	4	105		
60	1,743,615	30,076,211	24,682	8,236	816	782	905	.....	2	106		
00	736,562	20,721,695	27,560	10,563	146	147	.....	1	1	107		
97	1,428,063	10,187,793	20,557	3,289	227	194	0	.....	1	108		
...	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
83	772,115	38,863,069	17,146	4,837	367	330	1,199	.....	8	109		
00	.....	64,889,000	56,932	10,869	1,085	549	408	2	15	110		
76	1,927,344	50,349,000	78,393	13,581	873	488	(G) 332	2	7	111		
57	2,192,449	80,717,013	76,771	21,480	1,372	991	(G) 1,364	2	16	112		
71	2,416,269	65,733,012	95,197	22,943	8,630	777	.....	4	25	113		
92	14,675,926	62,097,000	41,574	12,335	724	903	843	3	8	114		
58	2,062,083	31,835,146	70,142	12,709	377	442	.....	.....	(S) 8	115		
76	6,655,311	(T) 39,127,907	29,165	8,106	374	49	369	1	13	116		
48	27,638,830	48,857,263	34,816	15,628	735	159	189	1	9	117		
32	3,126,118	19,218,706	56,117	8,407	636	275	(G) 52	1	1	118		
992	6,132,614	26,936,313	41,373	10,660	2,387	230	.....	2	6	119		
240	1,743,809	29,510,376	47,862	9,586	2,626	411	.....	3	5	120		
206	8,129,732	38,389,298	29,549	8,951	2,424	524	(A) 1,053	1	8	121		
544	726,669	32,142,814	50,142	10,228	225	.....	.....	.....	.....	122		
344	713,234	13,483,391	15,199	3,132	194	56	(G) 453	1	2	123		

(t) Kw.-hr. transferred from associated companies.

(u) Includes 109,870,698 kw.-hr. transferred to associated companies.

(v) Customers of all classes included under domestic.

(w) Includes company's share of jointly owned plant (Stanton).

(x) Includes company's share of jointly owned plant (Deepwater).

(y) Includes as credit 81,824,000 kw.-hr. economy flow to other companies.

(z) Retail combined with wholesale.

(A) Rural service.

(B) Includes 31,023 hall light customers.

(C) Additional capacity is available by contract, or by lease and contract, as follows:

Co. No.	No. of Plants	Kw.
85	8	4,128
99	2	68,000

(D) Includes company's share of jointly owned plant (Windsor).

(E) Company-owned.

(F) Includes one plant, 312 kw., internal combustion.

(G) Farm service or agricultural.

(H) Includes one plant, 1,100 kw., internal combustion.

(I) Net; 1,821,145,000 kw.-hr. total purchased less 191,447,000 kw.-hr. sales for resale.

(J) Fuel consumers and rural service.

(K) Company sells at wholesale only. No segregated classification.

(L) Leased plants.

The reported number and rating includes plants (not in general segregated as to kind of power) operated under contract or lease as follows:

Co. No.	No. of Plants.	Kw.
2	1	50 (Hydro)
4	1	30,000
15	5	50,000
39	2	..... (Hydro)
41	1	16,000 (Fuel)
49	1	18,000 (Fuel)
54	2	15,520 (Hydro)
84	5	119,400
92	1	7,500 (Hydro)
100	1	3,000 (Fuel)
112	1	2,000 (Fuel)
114	1	390
125	5	28,300
127	1	600
129	6	107,200
130	1	1,800
142	1	1,100
152	2	96,234 (Hydro)
161	1	12,975
173	2	16,000 (Hydro)

(M) Two of these are combination steam and Diesel.

(N) Includes energy used in gas, water, bus or ice departments, or in combinations of such departments.

(O) Includes Kentucky & West Virginia Power Co., Inc., and Kingsport Utilities, Inc.

(P) Sales to municipal systems included under municipal service.

(Q) Includes Broad River Power Co. and Lexington Water Power Co.

(R) Includes rural service.

(S) Includes 1,921,000 kw.-hr., one customer, interchange.

(T) Includes 30,924 kw.-hr. free service.

(U) Three of these plants operated—68,500 kw., others stand-by

0	186,934,051	156,441,285	30,492,766	27,279,837	14,773,278	87,982,549	8,014,565			3,520,397	14,109,240	
0	186,102,888	181,761,547	4,341,341	17,239,210	14,003,978	51,573,087	5,282,743	(A)	1,047,628	37,006	50,400,206	
790	172,707,153	129,399,625	43,307,528	24,258,947	58,841,916	32,079,788	1,959,664			6,308,811	16,388,544	
0	89,443,680	89,443,680	0	8,766,388	19,134,154	30,077,103	1,559,170	(G)	864,166	5,807,230	9,038,844	

	Totals for section	119	549,094	25	820,433	3,592,702,566	2,700,999,688			891,702,878		
	West South Central States											
109	Louisiana Power & Light Company	15	90,122	0	0	551,155,000	485,116,000			66,039,000		8,78
110	Texas Electric Service Company	12	102,069	0	0	452,534,000	449,224,000			3,310,000		32,13
111	Houston Lighting & Power Company	7	187,681	0	0	435,971,000	399,117,000			36,854,000		45,22
112	Texas Power & Light Company	15	(L) 99,226	4	885	435,440,000	311,895,000			123,545,000		40,62
113	Oklahoma Gas & Electric Company	17	184,520	0	0	430,351,857	405,132,309			25,219,548		50,02
114	Arkansas Power & Light Company	40	(L) 38,000	3	(L) 65,666	301,055,000	107,933,000			193,122,000		21,47
115	New Orleans Public Service Inc.	3	112,700	0	0	297,521,000	297,521,000			0		32,37
116	Gulf States Utilities Company	13	77,770	0	0	223,004,239	116,839,439			106,164,800		18,16
117	Central Power & Light Company	10	53,226	5	15,000	220,637,696	177,892,334			42,745,362		20,71
118	Dallas Power & Light Company	1	82,500	0	0	209,154,642	207,265,500			1,889,142		33,87
119	Southwestern Gas & Electric Company	14	45,700	0	0	194,055,928	120,449,631			73,606,297		20,51
120	Public Service Company of Oklahoma	(U) 14	(U) 79,320	0	0	186,934,051	156,441,285			30,492,766		27,27
121	West Texas Utilities Company	22	53,918	0	0	186,102,888	181,761,547			4,341,341		17,23
122	San Antonio Public Service Company	2	99,050	2	790	172,707,153	129,399,625			43,307,528		24,25
123	El Paso Electric Company (and Affiliates)	3	59,864	0	0	89,443,680	89,443,680			0		8,76
	Totals for section	188	1,365,666	14	82,341	4,386,068,134	3,635,431,350			750,636,784		
	Mountain States											
124	The Montana Power Company	2	900	11	293,400	613,026,278	605,932,000			7,094,278		37,22
125	Utah Power & Light Company	5	(L) 42,740	37	(L) 182,472	493,678,000	285,468,000			208,210,000	(k)	61,00
126	Idaho Power Company	0	0	8	71,500	391,999,391	366,002,530			25,996,861		31,02
127	Public Service Company of Colorado	(X) 14	(L, X) 89,200	11	(L) 37,800	293,178,934	289,971,850			3,207,084		47,83
128	Salt River Valley Water Users' Association	0	0	8	70,050	191,951,640	177,295,640			14,656,000	(A)	5,93
	Totals for section	21	132,840	75	655,222	1,983,834,243	1,724,670,020			259,164,223		
	Pacific States											
129	Pacific Gas & Electric Company	15	(L) 380,600	50	(L) 879,144	4,004,245,763	2,972,201,338			1,032,044,425		447,02
130	Southern California Edison Company Ltd.	5	(L) 461,600	24	(L) 490,140	2,856,602,851	2,844,728,428			11,874,423		263,99
131	Puget Sound Power & Light Company	7	112,000	13	150,675	824,481,187	759,750,708			64,730,479		163,32
132	City of Los Angeles, Bureau of Power & Light	0	0	5	110,605	722,331,128	306,371,800			415,959,328		
133	The Washington Water Power Company	1	150	13	205,034	647,596,251	636,404,450			11,191,801		85,74
134	Portland General Electric Company	3	75,500	6	94,480	514,789,600	505,866,600			8,923,000		90,58
135	Hetch Hetchy Water Supply (San Francisco)	0	0	2	83,300	507,323,840	507,323,840			0		
136	The California Oregon Power Company	3	(Z) 15,410	12	100,080	471,471,767	458,780,007			12,691,760		35,64
137	Los Angeles Gas & Electric Corporation	2	148,700	0	0	340,886,410	332,495,246			8,391,164	(aa)	181,77
138	City of Seattle, Dept. of Lighting	1	30,000	2	133,000	334,605,000	333,380,000			1,225,000		89,70
139	The Nevada-California Electric Corporation System (dd)	3	8,257	11	58,575	(V) 295,604,426	(V) 258,521,625			37,082,801	(ee)	7,54
140	Northwestern Electric Company	2	9,600	1	42,500	284,388,516	94,652,101			189,736,415		37,11
141	City of Tacoma, Dept. of Public Utilities	2	34,000	3	124,000	219,414,450	218,497,450			917,000		41,79
142	Pacific Power & Light Company	1	(L) 8,000	9	(L) 22,567	199,201,401	133,519,116			65,682,285		61,54
143	San Diego Consolidated Gas & Electric Company	2	74,000	0	0	182,035,810	169,704,900			12,330,910		36,69
144	Mountain States Power Company	21	(Z) 31,225	7	6,306	104,430,631	30,580,287			73,850,344		30,77
	Totals for section (Z)	67	1,374,042	158	2,500,406	12,509,409,031	10,562,777,896			1,946,631,135		
	Canada											
145	Hydro-Electric Power Commission of Ontario	1	20,000	38	889,100	4,221,001,199	2,829,958,629			1,391,042,570		
146	The Shawinigan Water & Power Company	0	0	7	496,650	3,170,358,660	2,399,530,520			770,828,140		20,03
147	Canadian Hydro-Electric Corporation, Ltd. System	1	6,750	18	506,014	2,527,827,765	2,525,520,672			2,307,093		9,80
148	Duke-Price Power Company, Ltd.	0	0	1	330,000	1,673,119,325	1,673,119,325			0		
149	Montreal Light, Heat & Power Consolidated	1	16,500	4	215,410	1,249,312,710	488,402,140			760,910,570		126,4
150	West Kootenay Power & Light Company, Ltd	0	0	4	169,000	580,021,067	580,021,067			0		2,6
151	Winnipeg Electric Company (ii)	1	12,000	3	251,028	518,856,200	518,856,200			0		75,42
152	City of Winnipeg Hydro-Electric System	(ll) 1	(ll) 11,190	2	(L) 96,234	486,799,830	384,103,830			102,696,000		174,7
153	Canada Northern Power Corporation, Ltd.	0	0	9	94,375	441,150,290	441,150,290			0		10,0
154	British Columbia Electric Railway Company, Ltd. (jj)	1	(kk) 17,500	5	(kk) 167,335	405,750,100	405,750,100			0		69,84
155	Canadian Niagara Power Company, Ltd.	0	0	1	75,000	282,433,000	282,433,000					
156	Abitibi Electric Development Company	0	0	1	(oo) 48,000	204,282,001	204,282,001			0		
157	Montreal Island Power Company	0	0	1	45,000	172,307,040	172,307,040			0		
158	Southern Canada Power Company, Ltd.	0	0	5	43,875	168,544,700	160,609,700			7,935,000		11,6
159	The Nova Scotia Power Commission	0	0	13	(oo) 62,955	159,428,487	159,428,487			0		2
160	Great Lakes Power Company, Ltd.	0	0	2	38,200	153,646,054	153,646,054			0		1
161	Calgary Power Company, Ltd.	4	(L) 14,090	3	(L) 53,000	145,950,224	143,427,388	(pp)	2,522,836			2,6
	Totals for Canada	10	94,530	117	3,510,744	16,560,788,652	13,522,546,443			3,038,242,209		
	Mexico											
162	The Mexican Light & Power Company, Ltd.	2	32,240	12	178,474	691,485,448	691,485,448			0		19,90
	Electric Railways and Electrified Railroads											
163	Interborough Rapid Transit Company	2	390,000	0	0	1,168,305,375	1,168,175,960			129,415		
164	Williamsburgh Power Plant Corporation (B. M. T.)	2	204,100	0	0	608,371,076	608,371,076			0		
165	Chicago Surface Lines	0	0	0	0	354,922,052	0			354,922,052		
166	Philadelphia Rapid Transit Company	0	0	0	0	304,313,972	0			304,313,972		
167	The Pennsylvania Railroad (Long Island City Gen. Station)	1	88,000	0	0	291,426,822	205,831,260			85,595,562		
168	Boston Elevated Railway	2	180,000	0	0	244,678,940	244,678,940			0		
169	The New York Central Railroad Company	2	110,000	0	0	228,941,683	172,152,683			56,789,000		
170	The New York, New Haven & Hartford Railroad Company	1	47,200	0	0	179,000,000	87,800,000			91,200,000		
171	St. Louis Public Service Company	2	21,600	0	0	152,489,148	6,979,248			145,509,900		
172	Pacific Electric Railway Company	0	0	0	0	143,901,864	0			143,901,864		
173	Twin City Rapid Transit Company	1	75,000	2	(L) 16,000	124,932,815	91,056,740			33,876,075		
174	Norfolk & Western Railway Company	6	43,855	0	0	99,938,196	74,288,342			25,649,854		
175	The Connecticut Company	1	22,500	0	0	78,774,178	32,195,710			46,578,468		
176	Chicago, Milwaukee, St. Paul & Pacific Railroad Company	0	0	0	0	67,439,697	0			67,439,697		
	Totals for Railways and Railroads	20	1,182,255	2	16,000	4,047,435,818	2,691,529,959			1,355,905,859		

206	8,129,732	38,389,298	29,549	8,951	2,424	524	(A) 1,053	1	8	121	(T) Includes 30,924 kw.-hr. free service.		
544	726,669	32,142,814	50,142	10,228	225					122			
844	713,234	13,483,391	15,199	3,132	194	56	(G) 453	1	2	123	(U) Three of these plants operated—68,500 kw., others stand-by		

8,789,492	6,969,637	173,969,718	3,781,112	1,214,874		316,794,983	772,115	38,863,069	17,146	4,837	367	
32,131,000	46,566,000	155,665,000	19,869,000	555,000	13,548,000	119,311,000		64,889,000	56,932	10,869	1,085	
45,227,092	82,337,337	186,827,844	31,426,315	(G) 4,489,119	24,366,673	9,020,276	1,927,344	50,349,000	78,393	13,581	873	
40,629,611	42,606,055	156,461,652	25,443,869	(G) 2,011,305	17,223,789	68,154,257	2,192,449	80,717,013	76,771	21,480	1,372	
50,028,297	52,056,869	203,842,117	26,609,550		17,399,272	12,266,471	2,416,269	65,733,012	95,197	22,943	8,630	
21,473,900	25,425,729	125,871,706	7,968,782	927,877	13,730,888	28,883,192	14,675,926	62,097,000	41,574	12,335	724	
32,378,359	32,174,402	89,048,559	17,372,873		40,303,720	(S) 52,345,858	2,062,083	31,835,146	70,142	12,709	377	
18,161,009	20,825,510	107,779,262	5,239,126	6,556,801	1,974,737	16,684,576	6,655,311	(T) 39,127,907	29,165	8,106	374	
20,713,010	36,783,829	72,460,652	5,568,704	734,370	576,190	7,304,848	27,638,830	48,857,263	34,816	15,628	735	
33,871,413	70,558,771	27,874,009	23,634,698	(G) 145,706	28,869,689	1,855,532	3,126,118	19,218,706	56,117	8,407	636	
20,513,760	24,024,127	88,174,361	7,432,211		6,606,550	14,235,992	6,132,614	26,936,313	41,373	10,660	2,387	
27,279,837	14,773,278	87,982,549	8,014,565		3,520,397	14,109,240	1,743,809	29,510,376	47,862	9,586	2,626	
17,239,210	14,003,978	51,573,087	5,282,743	(A) 1,047,628	37,006	50,400,206	8,129,732	38,389,298	29,549	8,951	2,424	
24,258,947	58,841,916	32,079,788	1,959,664		6,308,811	16,388,544	726,669	32,142,814	50,142	10,228	225	
8,766,388	19,134,154	30,077,103	1,559,170	(G) 864,166	5,807,230	9,038,844	713,234	13,483,391	15,199	3,132	194	
37,225,960	37,345,647	340,825,743	8,113,718	2,558,782	54,296,448	8,673,500		123,986,480	50,313	10,617	214	
61,004,690	(z)	(z) 276,744,947	15,606,125	120,014	38,296,386	6,292,071	3,676,894	91,936,873	(k) 80,642	(z)	(z) 10,158	
31,029,162	25,796,529	44,810,275	8,943,629	(G) 19,362,877		(W) 200,031,095	3,371,180	58,654,644	24,204	4,943	480	
47,834,754	45,398,981	109,121,053	9,291,899		121,517	21,774,609	3,426,473	56,209,648	100,413	16,182	6,450	
5,931,677	0	0	0	(Y) 75,612,450	0	69,495,596	13,896,767	27,015,150	(A) 4,054	0	0	
47,025,387	296,288,696	1,204,216,161	59,510,952	500,371,970	278,834,327	151,374,568	64,210,266	1,002,413,436	575,938	86,952	35,352	
63,993,137	175,113,925	646,840,535	42,997,448	(G) 361,974,767	239,164,541	553,586,242	4,746,134	568,186,122	397,465	51,269	20,090	
63,323,995	167,224,250	208,107,425	6,037,265		53,820,214	21,215,533	(n)	(n) 204,752,505	136,060	21,192	808	
85,744,245	70,056,550	224,790,092	6,172,469	(G) 22,398,371	44,364,619	77,610,648	(n)	(n) 116,459,257	47,993	8,765	364	
90,584,271	87,778,086	141,793,115	25,632,120		57,930,601	11,326,963	2,699,756	97,044,688	93,914	11,497	391	
0	0	0	0	0	0	443,886,800	32,810,246	30,626,794	0	0	0	
35,641,910	12,675,518	41,301,971	2,086,284	0	0	301,540,404	3,539,753	74,685,927	19,013	4,169	1,215	
81,773,569	(aa) 91,263,844		4,464,640			9,396,200	5,668,351	48,319,806	((bb) 142,184	(bb) 9,675		(bb)
89,767,195	49,778,825	45,905,048	27,534,745	9,882,127	32,847,010	4,000	7,074,584	71,811,466	81,860	9,543	3,068	
7,544,726	(ff) 13,296,181	105,253,342	2,874,281	(gg) 10,219,433		(hh) 57,822,264	9,796,121	88,798,078	(ee) 17,419	(ff) 5,871	(h) 2,905	(h)
37,115,100	42,556,239	144,046,542	5,355,773	(cc) 3,089,826		8,790,420	8,039,622	35,394,994	30,120	5,057	453	
41,797,711	122,507,928		6,788,819	2,464,426	952,780	6,256,488	6,070,653	32,575,645	27,036	5,801		
61,543,916	71,113,494		2,960,496		1,900,360	15,419,501	4,575,961	41,687,673	40,388	7,776		
36,697,594	31,584,874	50,973,891	6,621,920		13,609,000	7,180,165	8,517,594	26,850,772	58,487	11,483	4,823	
30,739,143	11,278,368	31,740,218	2,895,321			1,535,461	2,327,764	23,914,356	37,503	8,668	2,660	
20,057,896	11,558,762	2,359,709,863	7,542,656			490,582,248	16,008,308	264,898,927	39,217	9,590	128	
9,868,209	18,253,266	2,448,087,049	3,105,954		3,577,700			44,935,587	16,626	3,901	22	
		1,122,691,690				550,427,635					4	
26,431,667	165,542,945	686,020,457	17,386,000		120,269,507	25,096,860		108,565,274	217,482	50,982	415	
2,651,749	1,776,708	518,595,674					2,788,544	54,208,392	3,045	543	12	
75,429,154	17,322,868	118,638,362	118,865,770	50,750,263	39,074,120	25,588,632		73,187,031				
74,719,668	74,008,620	44,379,083	14,413,931	(mm) 113,973,400		377,760		64,927,368	40,551	6,062	(nn)	
10,032,387	4,880,517	380,742,484	749,491		630,382			44,115,029	10,020	2,441	45	
69,848,235	52,178,732	143,362,791	12,931,515		78,770,815	6,429,716	7,110,368	35,117,928	80,054	13,794	2,756	
0	0	0	0	0	0	172,307,040	0	0	0	0	0	
11,657,500	23,263,725	50,401,335	2,987,500	(G) 635,250	0	71,585,730		8,013,660	20,512	4,899	68	
257,146	207,890	110,672,760	24,000			39,640,018	868,038	7,758,635	769	3	4	
128,294	66,839	135,027,603	46,022		923,155	15,013,800		2,440,341	272	86	9	
2,674,517	5,498,613	7,242,412	1,155,372	(G) 205,953		110,677,172	303,600	18,192,585	7,009	4,714	10	
19,901,002	44,055,672	264,837,253	46,967,936	(qq) 20,956,467	74,079,733		8,754,359	211,933,026	117,731	45,669	255	

Summary of Generator Rating and Output

Section	Number of Companies or Systems	Number of Generating Plants and Generator Ratings — All Plants — No.	All Plants — Rating Kw.	Fuel Plants — No.	Fuel Plants — Rating Kw.	Hydro Plants — No.	Hydro Plants — Rating Kw.	Energy Generated (Net), Kw.-Hr.	Energy Purchased, Kw.-Hr.
United States	**144**	**1,884**	**30,678,632**	**971**	**21,905,581**	**913**	**8,773,051**	**71,636,499,323**	**15,276,782,129**
New England	14	172	2,295,431	44	1,580,152	128	715,279	4,513,193,098	1,656,717,250
Middle Atlantic	23	342	8,574,176	144	6,793,326	198	1,780,850	21,386,625,939	3,089,079,808
East North Central	33	297	6,949,201	160	6,636,735	137	312,466	15,924,041,482	4,740,373,440
West North Central	13	180	2,219,040	112	1,678,809	68	540,231	5,041,527,418	97,013,867
South Atlantic	15	226	3,160,740	116	1,794,917	110	1,365,823	6,147,232,432	1,845,462,744
East South Central	10	144	1,369,527	119	549,094	25	820,433	2,700,999,688	891,702,878
West South Central	15	202	1,448,007	188	1,365,666	14	82,341	3,635,431,350	750,636,784
Mountain	5	96	788,062	21	132,840	75	655,222	1,724,670,020	259,164,223
Pacific	16	225	3,874,448	67	1,374,042	158	2,500,406	10,562,777,896	1,946,631,135
Canada	**17**	**127**	**3,605,274**	**10**	**94,530**	**117**	**3,510,744**	**13,522,546,443**	**3,038,242,209**
Mexico	**1**	**14**	**210,714**	**2**	**32,240**	**12**	**178,474**	**691,485,448**	**0**
Railways and Railroads	**14**	**22**	**1,198,255**	**20**	**1,182,255**	**2**	**16,000**	**2,691,529,959**	**1,355,905,859**

0	198,282,094	0	198,282,094	24,052,487	37,023,773	70,074,220	5,724,328	(G)	186,888	34,875,994		
0	172,532,740	172,531,300	1,440	23,208,931	43,639,111	34,520,348	8,817,305			25,955,272	12,058,840	
0	132,226,989	4,400,422	127,826,567	15,235,922	17,196,294	50,624,810	14,030,829		1,512,154	1,578,994	228,160	
0	103,725,735	18,767,679	(g) 84,958,056	16,145,256	23,281,538	37,181,539	2,912,889			857,156	1,889,100	
150	93,796,831	491,480	93,305,351	12,383,408	14,160,338	44,283,375	3,122,210		0	7,070,747	1,160,897	
820,433	3,592,702,566	2,700,999,688	891,702,878									
0	551,155,000	485,116,000	66,039,000	8,789,492	6,969,637	173,969,718	3,781,112		1,214,874		316,794,983	
0	452,534,000	449,224,000	3,310,000	32,131,000	46,566,000	155,665,000	19,869,000		555,000	13,548,000	119,311,000	
0	435,971,000	399,117,000	36,854,000	45,227,092	82,337,337	186,827,844	31,426,315	(G)	4,489,119	24,366,673	9,020,276	
885	435,440,000	311,895,000	123,545,000	40,629,611	42,606,055	156,461,652	25,443,869	(G)	2,011,305	17,223,789	68,154,257	
0	430,351,857	405,132,309	25,219,548	50,028,297	52,056,869	203,842,117	26,609,550			17,399,272	12,266,471	
(L) 65,666	301,055,000	107,933,000	193,122,000	21,473,900	25,425,729	125,871,706	7,968,782		927,877	13,730,888	28,883,192	
0	297,521,000	297,521,000	0	32,378,359	32,174,402	89,048,559	17,372,873			40,303,720	(S) 52,345,858	
0	223,004,239	116,839,439	106,164,800	18,161,009	20,825,510	107,779,262	5,239,126		6,556,801	1,974,737	16,684,576	
15,000	220,637,696	177,892,334	42,745,362	20,713,010	36,783,829	72,460,652	5,568,704		734,370	576,190	7,304,848	
0	209,154,642	207,265,500	1,889,142	33,871,413	70,558,771	27,874,009	23,634,698	(G)	145,706	28,869,689	1,855,532	
0	194,055,928	120,449,631	73,606,297	20,513,760	24,024,127	88,174,361	7,432,211			6,606,550	14,235,992	
0	186,934,051	156,441,285	30,492,766	27,279,837	14,773,278	87,982,549	8,014,565			3,520,397	14,109,240	
0	186,102,888	181,761,547	4,341,341	17,239,210	14,003,978	51,573,087	5,282,743	(A)	1,047,628	37,006	50,400,206	
790	172,707,153	129,399,625	43,307,528	24,258,947	58,841,916	32,079,788	1,959,664			6,308,811	16,388,544	
0	89,443,680	89,443,680	0	8,766,388	19,134,154	30,077,103	1,559,170	(G)	864,166	5,807,230	9,038,844	
82,341	4,386,068,134	3,635,431,350	750,636,784									
293,400	613,026,278	605,932,000	7,094,278	37,225,960	37,345,647	340,825,743	8,113,718		2,558,782	54,296,448	8,673,500	
(L) 182,472	493,678,000	285,468,000	208,210,000	(k) 61,004,690	(z)	(z) 276,744,947	15,606,125		120,014	38,296,386	6,292,071	
71,500	391,999,391	366,002,530	25,996,861	31,029,162	25,796,529	44,810,275	8,943,629	(G)	19,362,877		(W) 200,031,095	
(L) 37,800	293,178,934	289,971,850	3,207,084	47,834,754	45,398,981	109,121,053	9,291,899			121,517	21,774,609	
70,050	191,951,640	177,295,640	14,656,000	(A) 5,931,677	0	0	0	(Y)	75,612,450	0	69,495,596	
655,222	1,983,834,243	1,724,670,020	259,164,223									
(L) 879,144	4,004,245,763	2,972,201,338	1,032,044,425	447,025,387	296,288,696	1,204,216,161	59,510,952		500,371,970	278,834,327	151,374,568	
(L) 490,140	2,856,602,851	2,844,728,428	11,874,423	263,993,137	175,113,925	646,840,535	42,997,448	(G)	361,974,767	239,164,541	553,586,242	
150,675	824,481,187	759,750,708	64,730,479	163,323,995	167,224,250	208,107,425	6,037,265			53,820,214	21,215,533	
110,605	722,331,128	306,371,800	415,959,328									
205,034	647,596,251	636,404,450	11,191,801	85,744,245	70,056,550	224,790,092	6,172,469	(G)	22,398,371	44,364,619	77,610,648	
94,480	514,789,600	505,866,600	8,923,000	90,584,271	87,778,086	141,793,115	25,632,120			57,930,601	11,326,963	
83,300	507,323,840	507,323,840	0	0	0	0	0		0	0	443,886,800	
100,080	471,471,767	458,780,007	12,691,760	35,641,910	12,675,518	41,301,971	2,086,284		0	0	301,540,404	
0	340,886,410	332,495,246	8,391,164	(aa) 181,773,569	(aa) 91,263,844		4,464,640				9,396,200	
133,000	334,605,000	333,380,000	1,225,000	89,767,195	49,778,825	45,905,048	27,534,745		9,882,127	32,847,010	4,000	
58,575	(V) 295,604,426	(V) 258,521,625	37,082,801	(ee) 7,544,726	(ff) 13,296,181	105,253,342	2,874,281	(gg)	10,219,433		(hh) 57,822,264	
42,500	284,388,516	94,652,101	189,736,415	37,115,100	42,556,239	144,046,542	5,355,773	(cc)	3,089,826		8,790,420	
124,000	219,414,450	218,497,450	917,000	41,797,711	122,507,928		6,788,819		2,464,426	952,780	6,256,488	
(L) 22,567	199,201,401	133,519,116	65,682,285	61,543,916	71,113,494		2,960,496			1,900,360	15,419,501	
0	182,035,810	169,704,900	12,330,910	36,697,594	31,584,874	50,973,891	6,621,920			13,609,000	7,180,165	
6,306	104,430,631	30,580,287	73,850,344	30,739,143	11,278,368	31,740,218	2,895,321				1,535,461	
2,500,406	12,509,409,031	10,562,777,896	1,946,631,135									
889,100	4,221,001,199	2,829,958,629	1,391,042,570									
496,650	3,170,358,660	2,399,530,520	770,828,140	20,057,896	11,558,762	2,359,709,863	7,542,656				490,582,248	
506,014	2,527,827,765	2,525,520,672	2,307,093	9,868,209	18,253,266	2,448,087,049	3,105,954			3,577,700		
330,000	1,673,119,325	1,673,119,325	0			1,122,691,690					550,427,635	
215,410	1,249,312,710	488,402,140	760,910,570	126,431,667	165,542,945	686,020,457	17,386,000			120,269,507	25,096,860	
169,000	580,021,067	580,021,067	0	2,651,749	1,776,708	518,595,674						
251,028	518,856,200	518,856,200	0	75,429,154	17,322,868	118,638,362	118,865,770		50,750,263	39,074,120	25,588,632	
(L) 96,234	486,799,830	384,103,830	102,696,000	174,719,668	74,008,620	44,379,083	14,413,931	(mm)	113,973,400		377,760	
94,375	441,150,290	441,150,290	0	10,032,387	4,880,517	380,742,484	749,491			630,382		
(kk) 167,335	405,750,100	405,750,100	0	69,848,235	52,178,732	143,362,791	12,931,515			78,770,815	6,429,716	
75,000	282,433,000	282,433,000										
(oo) 48,000	204,282,001	204,282,001	0									
45,000	172,307,040	172,307,040	0	0	0	0	0		0	0	172,307,040	
43,875	168,544,700	160,609,700	7,935,000	11,657,500	23,263,725	50,401,335	2,987,500	(G)	635,250	0	71,585,730	
(oo) 62,955	159,428,487	159,428,487	0	257,146	207,890	110,672,760	24,000				39,640,018	
38,200	153,646,054	153,646,054	0	128,294	66,839	135,027,603	46,022			923,155	15,013,800	
(L) 53,000	145,950,224	143,427,388	(pp) 2,522,836	2,674,517	5,498,613	7,242,412	1,155,372	(G)	205,953		110,677,172	
3,510,744	16,560,788,652	13,522,546,443	3,038,242,209									
178,474	691,485,448	691,485,448	0	19,901,002	44,055,672	264,837,253	46,967,936	(qq)	20,956,467	74,079,733		
0	1,168,305,375	1,168,175,960	129,415									
0	608,371,076	608,371,076	0									
0	354,922,052	0	354,922,052									
0	304,313,972	0	304,313,972									
0	291,426,822	205,831,260	85,595,562									
0	244,678,940	244,678,940	0									
0	228,941,683	172,152,683	56,789,000									
0	179,000,000	87,800,000	91,200,000									
0	152,489,148	6,979,248	145,509,900									
0	143,901,864	0	143,901,864									
(L) 16,000	124,932,815	91,056,740	33,876,075									
0	99,938,196	74,288,342	25,649,854									
0	78,774,178	32,195,710	46,578,468									
0	67,439,697	0	67,439,697									
16,000	4,047,435,818	2,691,529,959	1,355,905,859									

Summary of Genera

Section	Number of Companies or Systems	Number of Generating Pla — All Plants — No.	Rating Kw.	— Fue No.
United States	**144**	**1,884**	**30,678,632**	**971**
New England	14	172	2,295,431	44
Middle Atlantic	23	342	8,574,176	144
East North Central	33	297	6,949,201	160
West North Central	13	180	2,219,040	112
South Atlantic	15	226	3,160,740	116
East South Central	10	144	1,369,527	119
West South Central	15	202	1,448,007	188
Mountain	5	96	788,062	21
Pacific	16	225	3,874,448	67
Canada	**17**	**127**	**3,605,274**	**10**
Mexico	**1**	**14**	**210,714**	**2**
Railways and Railroads	**14**	**22**	**1,198,255**	**20**

	1,221,314	23,111,619	37,052	9,159	195	151		1	4	105
	1,743,615	30,076,211	24,682	8,236	816	782	905		2	106
	736,562	20,721,695	27,560	10,563	146	147		1	1	107
	1,428,063	10,187,793	20,557	3,289	227	194	0		1	108
	772,115	38,863,069	17,146	4,837	367	330	1,199		8	109
		64,889,000	56,932	10,869	1,085	549	408	2	15	110
	1,927,344	50,349,000	78,393	13,581	873	488	(G) 332	2	7	111
	2,192,449	80,717,013	76,771	21,480	1,372	991	(G) 1,364	2	16	112
	2,416,269	65,733,012	95,197	22,943	8,630	777		4	25	113
	14,675,926	62,097,000	41,574	12,335	724	903	843	3	8	114
	2,062,083	31,835,146	70,142	12,709	377	442		(S)	8	115
	6,655,311	(T) 39,127,907	29,165	8,106	374	49	369	1	13	116
	27,638,830	48,857,263	34,816	15,628	735	159	189	1	9	117
	3,126,118	19,218,706	56,117	8,407	636	275	(G) 52	1	1	118
	6,132,614	26,936,313	41,373	10,660	2,387	230		2	6	119
	1,743,809	29,510,376	47,862	9,586	2,626	411		3	5	120
	8,129,732	38,389,298	29,549	8,951	2,424	524	(A) 1,053	1	8	121
	726,669	32,142,814	50,142	10,228	225					122
	713,234	13,483,391	15,199	3,132	194	56	(G) 453	1	2	123
		123,986,480	50,313	10,617	214	95	1,843	3	8	124
	3,676,894	91,936,873	(k) 80,642	(z)	(z) 10,158	901		6	15	125
	3,371,180	58,654,644	24,204	4,943	480	567	(G) 8,747		(W) 9	126
	3,426,473	56,209,648	100,413	16,182	6,450	63		1	13	127
	13,896,767	27,015,150	(A) 4,054	0	0	0	(Y) 352	0	9	128
	64,210,266	1,002,413,436	575,938	86,952	35,352	618	35,764	15	30	129
	4,746,134	568,186,122	397,465	51,269	20,090	432	(G) 15,279	3	11	130
	(n)	(n) 204,752,505	136,060	21,192	808	140		5	14	131
										132
	(n)	(n) 116,459,257	47,993	8,765	364	79	(G) 4,737	3	17	133
	2,699,756	97,044,688	93,914	11,497	391	439		9	7	134
	32,810,246	30,626,794	0	0	0	0	0	0	2	135
	3,539,753	74,685,927	19,013	4,169	1,215	93	0	0	6	136
	5,668,351	48,319,806	((bb) 142,184	(bb) 9,675		(bb) 253			(bb) 1	137
	7,074,584	71,811,466	81,860	9,543	3,068	1	374	6	1	138
	9,796,121	88,798,078	(ee) 17,419	(ff) 5,871	(h) 2,905	(h) 112	(gg) 3,406		(h) 14	139
	8,039,622	35,394,994	30,120	5,057	453	162	(cc) 3,634		3	140
	6,070,653	32,575,645	27,036	5,801		1	1	1	14	141
	4,575,961	41,687,673	40,388	7,776		118		2	5	142
	8,517,594	26,850,772	58,487	11,483	4,823	24		1	4	143
	2,327,764	23,914,356	37,503	8,668	2,660	77			6	144
										145
	16,008,308	264,898,927	39,217	9,590	128	228			5	146
		44,935,587	16,626	3,901	22	97		1		147
					4				3	148
		108,565,274	217,482	50,982	415	23		1	12	149
	2,788,544	54,208,392	3,045	543	12					150
		73,187,031								151
		64,927,368	40,551	6,062	(nn)	7			1	152
		44,115,029	10,020	2,441	45	15		1		153
	7,110,368	35,117,928	80,054	13,794	2,756	16			2	154
										155
										156
	0	0	0	0	0	0	0	0	1	157
		8,013,660	20,512	4,899	68	114	(G) 1,275	0	5	158
	868,038	7,758,635	769	3	4	1			12	159
		2,440,341	272	86	9	3		1	1	160
	303,600	18,192,585	7,009	4,714	10	97	(G) 280		10	161
	8,754,359	211,933,026	117,731	45,669	255	1,358	(qq) 23,672	1		162

nerator Rating and Output

g Plants and Generator Ratings—				Energy		
—Fuel Plants—		—Hydro Plants—		Generated	Energy	Total Energy
	Rating		Rating	(Net),	Purchased,	Output,
o.	Kw.	No.	Kw.	Kw.-Hr.	Kw.-Hr.	Kw.-Hr.
71	**21,905,581**	**913**	**8,773,051**	**71,636,499,323**	**15,276,782,129**	**86,913,281,452**
44	1,580,152	128	715,279	4,513,193,098	1,656,717,250	6,169,910,348
44	6,793,326	198	1,780,850	21,386,625,939	3,089,079,808	24,475,705,747
60	6,636,735	137	312,466	15,924,041,482	4,740,373,440	20,664,414,922
12	1,678,809	68	540,231	5,041,527,418	97,013,867	5,138,541,285
16	1,794,917	110	1,365,823	6,147,232,432	1,845,462,744	7,992,695,176
19	549,094	25	820,433	2,700,999,688	891,702,878	3,592,702,566
88	1,365,666	14	82,341	3,635,431,350	750,636,784	4,386,068,134
21	132,840	75	655,222	1,724,670,020	259,164,223	1,983,834,243
67	1,374,042	158	2,500,406	10,562,777,896	1,946,631,135	12,509,409,031
10	**94,530**	**117**	**3,510,744**	**13,522,546,443**	**3,038,242,209**	**16,560,788,652**
2	**32,240**	**12**	**178,474**	**691,485,448**	**0**	**691,485,448**
20	**1,182,255**	**2**	**16,000**	**2,691,529,959**	**1,355,905,859**	**4,047,435,818**

	173	2	16,000	(Hydro)

(*M*) Two of these are combination steam and Diesel.

(*N*) Includes energy used in gas, water, bus or ice departments, or in combinations of such departments.

(*O*) Includes Kentucky & West Virginia Power Co., Inc., and Kingsport Utilities, Inc.

(*P*) Sales to municipal systems include under municipal service.

(*Q*) Includes Broad River Power Co. and Lexington Water Power Co.

(*R*) Includes rural service.

(*S*) Includes 1,921,000 kw.-hr., one customer, interchange.

(*T*) Includes 30,924 kw.-hr. free service.

(*U*) Three of these plants operated—68,500 kw., others stand-by.

(*V*) Gross.

(*W*) Includes 191,511,670 kw.-hr., three customers, interchange.

(*X*) Includes three plants, 2,100 kw. internal combustion.

(*Y*) Irrigation power.

(*Z*) Fuel-burning plants of both California Oregon Power Co. and Mountain States Power Co. include Coos Bay 15,000-kw. plant leased by former from latter. In total regional kw. this plant is counted only once.

(*aa*) Domestic and commercial light are combined under domestic; domestic and commercial power under commercial (retail).

(*bb*) "Active meters," replacing formerly reported "connected meters." Corresponding numbers applying to Supplement of May 7, 1932, are—144,-886; 9,568; 254; 1; 168. [See also (*aa*)].

(*cc*) Includes 2,347,596 kw.-hr., 3,633 customers, farm service.

(*dd*) Includes Nevada-California Power Co., Southern Sierras Power Co. and Yuma Utilities Co.

(*ee*) Includes heat: residential, 1,798,157 kw.-hr., 1,355 meters.

(*ff*) Includes heat, commercial, 5,558,297 kw.-hr., 1,090 meters.

(*gg*) Combination light and heat, kw.-hr. and meters.

(*hh*) Includes 10,485,388 kw.-hr. interchange.

(*ii*) Includes Manitoba Power Co., Ltd., and Northwestern Power Co., Ltd.

(*jj*) Lower mainland system only.

(*kk*) Kva.

(*ll*) Standby.

(*mm*) Central heating.

(*nn*) 1,423 customers included in other groups.

(*oo*) Horsepower.

(*pp*) Includes 2,184,376 kw.-hr. net interchange.

(*qq*) Cooking and heating.